# THE AMERICAN GAS LIGHT JOURNAL

REDMAN&KENNY,N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME XXXVI. No. 7. Whole No. 547. | NEW YORK, MONDAY, APRIL 3, 1882. | $3 PER ANNUM IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager
G. WARREN DRESSER, C.E., Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND CLASS MATTER.

**Terms of Subscription, Including Postage.**—For the United States and Canada, $3 per annum. European Countries, $3.50 (15 shillings—18 francs). All payments to be made in advance. Single copies, 15 cents.

**Remittances** should be made either by post-office order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

**Collections** are invariably made directly from this office, for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.


## CONTENTS.

☞ An asterisk (*) denotes an illustrated article


The Western Gas Association ..... 145
Volume III. King's Treatise on Coal Gas ..... 145

EDITORIALS—

Street Lighting in New York City ..... 145
The Gas Institute at the Electrical Exhibition, London ..... 146
The Petroleum Outlook ..... 146
Haswell's Engineers and Mechanics Pocket Manual ..... 146
Twelfth Annual Meeting of the New England Association of Gas Engineers ..... 147
On the Determination of Sulphur in Coal ..... 153
Gas Industry.—Notes and Observations ..... 154
Price of Gas at Youngstown, Ohio ..... 155
Prospects of another Gas War ..... 155
Proceedings of Physical Society ..... 155
The Coal Tar Nuisance ..... 155

CORRESPONDENCE—

Reply to "Engineer" ..... 155
Electric Light at Akron, Ohio ..... 156
Relation of Holder Capacity to Maximum Make ..... 156
Bids for Public Lamps in the City of New York ..... 157
Effect of Colored Glass on Liquids ..... 157
Equitable Gas Light Company, New York City ..... 157


A telegram to the New York Daily *World*, of March 31st, announces the death, in Paris, France, of Mr. E. Stern.

[OFFICIAL NOTICE.]

### The Western Gas Association

SECY'S OFFICE, WESTERN GAS ASSOCIATION,
110 VINE ST., ST. LOUIS, MO., Feb. 21, 1882.

The Fifth Annual Meeting of the Western Gas Association will be held at the Grand Pacific Hotel, Chicago, Ills., on the 10th, 11th and 12th days of May, 1882. A full attendance is requested, as matters of great interest will be presented at the Meeting.

LEE A. HALL, *Secretary.* THOS. BUTTERWORTH, *President.*

### VOLUME III. KING'S TREATISE ON COAL GAS.

In our last issue we called attention to the fact that this valuable work is now complete. Orders for the same, accompanied by draft or post office money order for $8.20 from subscribers to former numbers, or $8.80 from new subscribers will be received at this office, and should be sent this month.

### STREET LIGHTING IN NEW YORK CITY.

During the past week bids were opened by the Gas Commission, at the Department of Public Works, for the lighting of the streets of the city for one year, from the first of May next. The prices bid by the different gas companies for this service will be found on page 157 of this issue.

In addition to the proposals for gas there were bids from two electric light companies for lighting some of the chief thoroughfares. The price at which electric light was furnished to the city last year was at the rate of about 33 cents per lamp per night; but the price asked this year is something of an advance upon last year's price.

It is not to be expected that any company organized for business purposes will continue to do business without a profit, whether it is serving the public or private individuals, and we see no reason why an electric light company should not receive a remunerative price for their service, if they perform it.

It is true that to light all the electric lights proposed would increase the cost of public lighting considerably, unless gas lamps were discontinued in some streets not occupied by the proposed supply of electric lights; but luxury costs money, and if the people want the additional light they must be prepared to pay for it.

When it is fully determined just what amount of additional money is to be devoted to an increased amount of light it will be time for the gas people to wake up and see what they can offer for the amount; but it is evident that under the contracts, as now arranged for street lighting, there is no opportunity to bid for anything but ordinary three feet per hour lamps, for 4,000 hours a year.

There is a difference between illumination and lighting. As an illumination the electric lights may do very well, and certainly, considering the nature of the article, they have done as well in New York as anywhere else; but, nevertheless, we believe it possible to "illuminate" our roadways with gas (but not for the price of *lighting*); while, as to relative cost, beauty, completeness and reliability of the lighting, there need be no question but that gas, burned under proper conditions, can be made to take the palm. The electric light has been of great service to the gas industry, and should be looked upon as a coadjutor and friend, and when they do public illumination they should be paid a living price, and not be asked to perform impossibilities.

We give below the details of the bids made by the electric light companies, from which it will appear that they propose to charge at the rate of $255.50 per annum for each ordinary light in the city, while at the High Bridge it is offered for $365 a year for each light, if the city furnishes the necessary steam, or $547.50 per lamp per annum if the company supplies the steam. Of course, the candle power of these lights is only spoken of by even thousands; and while one company offers lights of a certain number of candles, "at a maximum, and by French measurement," the other proposes to give lights "of 2,000 candles power by photometrical test." It is a matter to be regretted that, in a great city like New York, no effort has been made on the part of the city to develop a better system of gas illumination in some of the main avenues so that the people could be able to judge not only of the relative efficiency but also of the cost of the two systems. At present high prices of gas in this city perhaps the electric light would have an advantage, as to relative cost, to which it is not fairly entitled; but

there is a very simple remedy for that, viz., to put down the price of gas to where it should be, and the large increase in consumption would soon make up the difference in the amount of money received. There is no reason why the streets of New York should not be able to exhibit to us as perfect and beautiful a system of gas illumination as the other cities of the world; and if it were once done no reasonable amount of additional cost would be grudged by the people. A little enterprise in this direction would be refreshing.

The following are the bids, above referred to, made by the Brush and the United States Illuminating Companies; the final decision upon the matter will be reached at an adjourned meeting of the Gas Commission, which is composed of the Mayor, the Comptroller, and the Commissioner of Public Works:

THE BRUSH ELECTRIC ILLUMINATING COMPANY.

"For voltaic arc lights, of the same kind as furnished last year, with carbons from 7-16ths to 5-8ths of an inch in diameter. The ordinary pole lights being not less than 2,000 and the mast lights not less than 6000 maximum candle power, tested by French measurement, at the rate of 70 cents per light per night, as follows:

| | | | | | | |
|---|---|---|---|---|---|---|
| Broadway | 14th | street to | 34th | street | 18 | lights. |
| 4th avenue | 18th | " | 59th | " | 33 | " |
| " | 42nd | " | 59th | " | | |
| Park avenue | 34th | " | 42nd | " | 8 | " |
| Madison " | 27th | " | 59th | " | 33 | " |
| Fifth " | 14th | " | 59th | " | 41 | " |
| Eighth " | 14th | " | 59th | " | 46 | " |
| 14th street | 4th | avenue to | 8th | avenue | 9 | " |
| 23rd " | 4th | " | 8th | " | 9 | " |
| 34th " | 4th | " | 8th | " | 10 | " |
| 42nd " | 4th | " | 8th | " | 11 | " |
| 57th " | 4th | " | 8th | " | 11 | " |
| 59th " | 4th | " | 8th | " | 11 | " |
| Madison Square on mast 6 lights equal to | | | | | 16 | " |
| Union " " 6 " | | | | | 16 | " |
| Total number of ordinary pole lights | | | | | 272 | " |

"Such portions of the above spaces, and such numbers of these lamps to be supplied at said price as the Gas Commission may prescribe."

The same company put in a separate bid for lighting the High Bridge, and the approaches thereto, with from 16 to 32 lights, at the rate of $1 per lamp per night, if steam is furnished from the city boilers at the pumping station at the Bridge, or $1.50 per lamp per night, if the Brush Company furnishes its own steam.

THE UNITED STATES ILLUMINATING COMPANY

propose as follows—to light 94 lights at the rate of 70 cents per lamp per night:

| | | |
|---|---|---|
| Broadway from the Battery to 14th street | 52 | lights. |
| Fifth ave., Washington Sq. to 14th " | 8 | " |
| Battery Park | 12 | " |
| City Hall Park | 10 | " |
| Washington Square | 12 | " |
| | 94 | " |

"These lights to be of not less than 2,000 candle power each, by photometrical test."

## The Gas Institute at the Electrical Exhibition, London.

At seven o'clock the members and friends of the Institute, to the number of 360, dined together in the Marble Hall at the Palace—the President (Mr. G. Wilson Stevenson, C.E., F.G.S.) in the Chair. After dinner the President said—

I am sure that some of you must have made sacrifices to be here to-day, for which we thank you. To those of us who saw the Paris Exhibition there is not much here to surprise or astonish; but I presume that a good many are here who did not see the Paris Exhibition, and to them there is here much to surprise and to interest, especially in the development which electric lighting has made during the last two years by means of what is known as the incandescent lamp. The arc lamp is quite out of the running for domestic lighting; but the incandescent lamp affords a light as nearly perfect, when it is at its best, as any artificial light can be. I can imagine that there are those among us who would be disposed to go so far as to admit that it is nearly as good as 16-candle gas, when burned under the best conditions. There are circumstances under which I could conceive that the incandescent lamp would be preferable to any other light, either of coal gas or oil gas—as, for instance, a residence in the tropics, with the thermometer at 90° in the shade all the year round. And yet I think there are some obstacles to be overcome, and some wholesome prejudices to be got rid of, before we shall see the dwellings in our cities and towns lighted from central stations by the incandescent electric lamp. In fact, gentlemen, whatever has been done up to the present time has been experiment and advertisement. (Hear, hear.) The experiments, so far as I know, have none of them been completely successful, and the advertisements have resulted only in inducing a few isolated individual manufacturers to purchase plant and go in for electric lighting "on their own hook." Nothing whatever has been done to demonstrate the feasibility of lighting a district or community from a central station. Now, until this has been tried, we shall not know whether it is practicable; and we shall literally know nothing of the cost of electric lighting. It is one thing to use the electric energy at the point at which it is generated; it is quite another thing to transmit that energy to a distance, and there attempt to utilize it at points far distant from the place at which it is generated. If electricity is ever to come into close competition with gas, it can only do so by becoming capable of sale at or near the same price. Even when this is accomplished I can conceive that there are many persons, perhaps the majority, who in this delightfully humid climate of ours would prefer gas, because of the warmth it gives along with its light. Sure I am that the whole of the lower middle class and the whole of the artisan class among us would perhaps be inclined to give a little more for gas than for electricity. Well, gentlemen, if this be so, inasmuch as the vendors of gas look to private consumption (domestic consumption) rather than to any other source, for success in business and their profit, I think we, who are actively engaged in this industry, need not fear to wake up some fine morning and find our occupation gone. In the meanwhile the electric light is doing us good—there is no doubt whatever about that. It is not an enemy but a friend. People have learned how huge a light may be produced by artificial means. They seek to have more light for themselves; and they say to us, "Can you give us a better light from gas?" Our answer is, "Certainly. If you will pay for it we will give you any amount of light you please." (Hear, hear.) And it is a fact that where electric lighting has been introduced a larger quantity of gas has been consumed. At the same time we are not warranted in despising this competitor. What we have to do is to cheapen and improve gas, and to instruct the consumers in the use of it.—*Journal of Gas Lighting.*

## The Petroleum Outlook.

The situation in the region has not undergone any great change since our last issue.

The Bradford field has steadily declined and the Richburg field has about supplied the decline by its increased yield. While the Richburg field has not been enlarged in area, the wells seem to be producing more regularly and more largely than was expected. The increased yield in the Richburg field is largely due, however, to the unprecedented activity which at present prevails there. All the surplus energy thrown loose by the waning of the Bradford field rushes for employment to Richburg, and the consequence is a much more rapid development there than was ever before known in the history of the business. From the most trustworthy information we can get, we are of the opinion that this field has now reached its maximum of daily production, as the wells are so closely located in the richer parts of the field, as to draw from each other, and thus finish the reservoir more speedily than could be the case in deliberate and conservative drilling.

There are no two opinions about the decline of the Bradford field, and that this decline must continue there can be but little doubt. The trade is now generally coming to look at the Richburg field, and at the probability of a new field as the chief factors for governing prices for the balance of the year. If the Richburg field exhausts by the energetic drilling as rapidly as it came up into prominence, and if no new field is discovered, the general expectation is that very much better prices must prevail in the latter half of year.

By reference to our tables it will be seen that the daily average production is substantially the same as it was last year.—Stowell's *Petroleum Reporter.*

## Haswell's Engineers and Mechanics Pocket Manual.

After completing the 40th Edition of this valuable work the author has again revised, enlarged and improved it, and the 41st Edition is presented for the use of the profession with seventy pages of new matter, and all the old tables, etc., carefully revised.

To the older engineers and mechanics no word of commendation is necessary for a work so long in high repute; while to the younger members we most cordially recommend the possession of a copy, and its constant study and use. The latest and fullest editions of works of this kind are the ones to be relied on if one would keep posted up to date.

THE NEW YORK GAS LIGHT COMPANY are about to lay a new 24-inch main from the Battery to Stanton street; they are also constructing new purifying apparatus.

[Official Report.—Continued from page 130.]

## Twelfth Annual Meeting of the New England Association of Gas Engineers.

Held at Young's Hotel, Boston, Feb. 15, 16, and 17, 1882.

*Continuation of Discussion upon Retort Furnaces.*

The President—Has any other gentleman anything to say upon the matter of retort furnaces?

Mr. Starr—A part of my business East has been to get reports of different furnaces. While I am very much pleased to hear the reports which have been made here, I will give you the results of the experiments I have been making for the last four months. I blow a draught into a chamber round my furnace chimney, heat it, and take it down over the top of the bench through a series of 5-inch pipes, and then bring it down by the front of the bench through 3-inch pipes; thence back of the bench to the lower flue, and then return it again within two feet of the front. There I have a hollow box, the top of which is level with the top of the grate bars. That box is about 4×8. There are some sixty holes drilled in the box to let this hot air out into the furnace; 30 of the holes come out below the grate bars and 30 out of the top of the box into a hollow casting which brings them out horizontally, right into the fire. The coke out of the lower retorts, which would be 33½ per cent. of the coke made, was used in the fires. My object in commencing the experiment was to try to get up some plan (which I still intend to try to perfect) to blow the coke dust into the fire, the same as I now blow the tar in, except that I use hot air instead of steam. In breaking and screening coke there is a considerable quantity of fine coke about the size of coarse corn meal. I think I can blow that in and have it burn before it falls to the grate bars. That experiment led me to figure as to the use of this bridge wall, which is built 2½ feet from the back of the furnace. I said that there would be a large quantity of coke which would be burned in mid-air; but I think the draught will blow it in and fill up the flue. To prevent that I intend to try a furnace built with an arch over the flue within 2 feet of the back wall, and then have all of the retorts open to the back wall. I can then run a hoe in and clean it out in case it goes there. Whether the plan will work or not I do not know. I would like to hear the ideas of some parties who have had experience in that direction. This hot air makes an intensely hot fire. We do not suffer at all in opening our fire doors to clinker out. We have to clinker a little oftener. We find on our grate bars a deposit of clinker from one-half to three-quarters of an inch thick. The fire is hottest when it is not over two inches thick on it. We run in a bar, first on one side and then on the other, and pull it out easily. It is intensely hot; it is so hot that my men cannot fire without having a protection for their eyes. I do not think I could get along in that bench without a blast. I am now using coke in that; heretofore I have used coal largely. My furnace is only 12 inches by four feet. I have a short chimney. I do not think that our draught would work off the amount of coal that we work off in that bench. We run from 250 to 300 pounds; we have run 325. I do not think the dampers are open over one-half or three-quarters of an inch. I have a little iron roof that comes down over the top of the chimneys, which takes all the smoke, dust, and ashes out of the side flues. They are small chimneys, 8×23. They take the dust, and make my retort house cleaner. The reflection through the top of the chimney on to the iron is about like moonlight. When we run it with the damper opened wide it would be of an orange color. In that way I think I make the heat in the furnace by this forced draught, which consumes the fuel without having to have so large an amount forced through the bars and up around the flues to go out at the top. In my other bench I run the flues from 4 to 6 feet high, right out of it. It was that waste of heat which started me in this direction, in order to try to save it. I thought it was wasted after it got out of the chimney. I shall try to perfect the blast furnace this summer. I shall get a larger blower and put on a heavier draught, and at the same time try not to blow in any of the small dust. I will be ready to report more thoroughly on that at the October meeting. I do not know whether any other person has tried to force a draught in that way. I tried it eight years ago to a limited extent.

Mr. Greenough—I think they are trying it in Washington.

Mr. Starr—I tried it eight years ago in connection with tar burning. I had this hot air, and I blew it in right under the tar burner. I ran the tar in by itself, and just as it dropped out of the upper pipe it came into this stream of hot air. It acted like a blow-pipe; it cut the tiles right out; and I never went any further in that direction. I had another trouble with it then. I used cast iron pipes under the lower flue, and they were so close to it that they burned out. When we rebuild any of the works I intend to try this experiment.

If Mr. Stedman is here, I want to say to him that I yield to him the jack-knife He laughed at my large yield, but when he takes a coke furnace with six retorts and gets 57,500 feet per day as an average for a month, I think he beats the West.

Mr. Stiness—He does it.

Mr. Starr—That is pretty good. The report which I gave yesterday of 69,000 was not on a regular run. It was what I was forced to do. I had to have it from some source. I did it with a tar bench. I never could get anything like that from a coke bench. I would like to inquire if in the Dieterich furnace you can burn tar.

The President—We are just now commencing experiments in that direction.

Mr. Starr—That has been a point of interest with me. I intend this summer to erect two benches, and I want to put in a regenerator furnace. If I cannot do it in any other way, I can hold my tar, which I can save while using those furnaces, and use it on the other benches. The tar bench with me is a success; I do not want anything better than tar, if I have enough of it. The trouble is that I get out of tar sometimes.

Major Dresser—Has Mr. Starr made any test of the temperature of that incoming air?

Mr. Starr—I have not; I only know that the pipe is too hot to bear my hand in it.

Major Dresser—Is the air heated by the exit gases from the bench?

Mr. Starr—Yes, it is, altogether. You may recall that at the last meeting I described a little apparatus that I was having made. I took an old boiler, some 20 inches in diameter, and, after cutting it into two pieces, I put through the center of it a 10- inch cast iron pipe. I put on heads, and had it made solid and air-tight. One foot from the top of it I put a flange, which went nearly across the whole end. A foot below that I put one starting from the other side and running nearly across; and then below that another. That made the hot air run back and forth four times before it got out of the pipe. That is put right on top of the chimney. By the time the air gets out of that it is pretty warm. Then it goes down into the circulating pipes on top of the bench. They are covered with ashes to protect them from the air.

Major Dresser—You do not blow the air into the boiler?

Mr. Starr—Yes; I have a fan which blows the hot air into the boiler and drives it down below. When we clinker we are not in a hurry to shut the door, because so much air goes in through the pipes that there is very little draught into the furnace. It does not draw air in at the door, and no cold air goes into the furnace. We do not see any diminution of heat by clinkering, as we used to.

Major Dresser—You have a pressure all through your setting?

Mr. Starr—All through; the air is driven off by pressure all the time.

Major Dresser—Is your yield of gas increased by this arrangement?

Mr. Starr—I cannot say; I am working other benches, and have no means of separating them.

Mr. Sherman—Professor Wilkinson, of the Mutual (N.Y.) works, showed me an apparatus last summer whereby he was to heat the retorts for making wood gas. He was consuming anthracite coal, heating the air as it passed over the flues, and utilizing the waste heat of his benches to heat this air; and then passing it into the furnace by the aid of a blast. I saw the same thing two years ago at Poughkeepsie, at the Citizens' works, where they are making water gas. They claimed that they had used various materials for fuel; they had used coke, and tar, and compressed coke or fine coke mixed with coal tar. They claimed that they were getting the best results from anthracite coal in connection with the air blast; but they did not heat their air. They made their steam from the waste heat from the bench. They had a boiler set on top of the benches. The disadvantage of having a boiler set on the flues of the benches in the ordinary setting is that it usually obstructs the draught; but with a force blast there was no difficulty in making all the steam that they wanted—and that was a good deal in their works, and their method of making gas. It seemed to me to be an economical method of heating the benches.

Mr. Starr—Is there some place where they are using a blast in that way?

Mr. Sherman—Yes; at the Mutual works in New York and at the Citizens' works in Poughkeepsie. But at the Citizens' works they were not heating their air; at the Mutual works they did heat all the air and forced it in with a blast fan.

Mr. Starr—Did they like it?

Mr. Sherman—They spoke very highly of it, and thought that they were making a saving in using it in that way.

Mr. Starr—I did not know whether I was a pioneer in this thing or not. I am glad to know that somebody else is using it, and I would like to compare results with them.

Mr. Sherman—I think the whole thing is old. I have read of it in the American Gas Light Journal. I think it was tried 25 or 30 years ago. I have forgotten why it was abandoned, but I remember reading about it some years ago.

Mr. Stiness—While I might sympathize with my friend Lamson in what

he says with regard to not preparing a paper upon the results obtained by the use of the Dieterich furnace, I must take issue with him in regard to the matter. If I fail in any experiments I am consoled by the knowledge that it is by the failures of others that we are able sometimes to make valuable improvements; and we who have got to travel the same paths which our good friends from Boston and many others have traveled, would be glad of any data which they could furnish us. They need not accompany the data with a recommendation of any particular furnace, but a simple statement of their experiments would be valuable to all of us. It would enable us, as we follow in the same way, to shun the shallow seas upon which they may perhaps have met misfortunes. For that reason I do believe that if our friends from the Boston Gas Company would furnish to this Association a simple statement of their trials, it would enable us to arrive at data or facts by means of which we could go on in the pursuit of knowledge, and it would result in benefits and marked improvements. I am at the present time commencing to build entirely new works, and I have therefore great interest in the matter of retort settings and in the matter of firing retorts. From the investigations which I have made, and from the testimony which has been presented to me to-day, I believe that any gas works, I care not of how limited a capacity, can ill afford at the present time to adopt any style of setting save that adapted to a regenerator furnace of some character. It need not be carried out to its fullest extent, but the same policy may be pursued which Mr. Lamson has indicated—of placing the foundation for the arches below the floor level. We shall then be enabled to adopt any style of furnace which the future may develop. I sincerely hope that at the next meeting, even if our Boston friends have not realized their most sanguine expectations, they will give to us some data upon which we can work.

Mr. Lamson—Mr. Stiness' remarks might seem to indicate that we were unfortunate in our experiments. I do not want anyone to go away with that impression.

Mr. Stiness—I disclaim any intent to convey any such idea as that.

Mr. Lamson—I simply said that so far as I am concerned I always objected to making statements of experiments until the experiments are concluded; and that by-and-by, when we have the furnaces working so that they give us entire satisfaction, we shall be very glad indeed to prepare a paper and give all the data to the Association. But while we are in the midst of experiments, and are having all sorts of successes and "misfortunes"—if you so call them—we do not exactly like to put them on paper. There are lots of things that we could say as to the advantages of this system; there are other things which we have tried and abandoned; and we are going to start this summer a series of experiments based upon the knowledge which we have gained from former experiments.

Mr. M. S. Greenough—There are some people who gain by the misfortunes of others; there are other people who learn wisdom by hard knocks. The latter class discovered the troubles of the regenerator furnace in the same way that you discover the location of the furniture in the room when you get out of bed in a dark room—by falling over the various pieces and barking your shins. A statement of the different places and times where and when you have barked your shins may perhaps be interesting to others, but they are not particularly pleasant for the person who relates it. We have been working over this thing now for about two years. About two years ago I read a paper before this Assocociation on the Dieterich furnace. Ever since then we have been working away at the subject, and you know that I have been looking elsewhere than in America for information with regard to furnaces. When I try to put in practice the general knowledge of the principles which I picked up when abroad, I find difficulties. The information which I got at that time has certainly been of very great value to us in certain ways; but I can honestly say that I think myself just about in a position at the present time to revisit those works appreciatively. After the six months of experimenting since my return, I feel as if I could go through those same works again and ask a series of questions which I did not know enough to ask at that time, and with the expectation of putting my knowledge to valuable uses. We have reached certain conclusions since our work last summer. My impression is that in rebuilding the furnaces, which we shall have to do this year, we shall make some changes which will be of value. But we do not want to come in here and call the attention of the Association to the mistakes and errors which we have made in the past. As Mr. Lamson says, when we get the thing to going satisfactorily to ourselves, then all the trouble we have been through, and all the mistakes which we have made, and by which we have learned something, as well as all the results of those mistakes, will be at the service of the Association. If we can come here a year from now and say that we have got a furnace with which we are entirely satisfied, we shall certainly do it. Until we have got such a furnace, I do not think it exactly becomes us to spread our mistakes before the Association; and especially when other gentlemen who are using the furnace do not seem to have experienced the same difficulties which we have encountered.

Mr. Stiness—I will offer a word of explanation. My friend from Boston misconstrued my idea. It is not the mistakes which they have made that are important, but it is the defects in the plan which has been submitted to them that we desire to know about. They work, of course, in good faith, and it is not to any lack of intelligence or skill upon their part, but to the lack of perfection in the system which has been presented to them, which has prevented them achieving success. My friend Greenough remarks that if he were to get out of bed in a dark night and stumble upon a piece of furniture, a statement of his experience would not be of benefit to others. Now, if he and I were occupying the same room it would certainly be a help to me to know where he had stumbled, in order that I might avoid the difficulties. In my remarks I did not wish to cast any reflection upon our friends from Boston, because I know that they pursued their experiments with the utmost intelligence, skill, and perseverance possible, and that their lack of entire success depends upon defects in the system, and not in their management.

Mr. Lamson—To keep on with this bumping of one's shins, if Mr. Greenough should get up in the night and bump his shins against a chair, and he should say to Mr. Stiness, "Over in that corner of the room I bumped my shins against a chair; don't you go over in that corner;" and if Mr. Stiness should steer directly away from it, and, being anxious not to hit against the chair, should run into the stove and burn himself, he might have wished that Mr. Greenough had kept still, and let him run into the chair. I do not believe in this plan of telling half the data of an experiment. If I were to tell you that in experimenting with the Dieterich furnace, at first we had the combustion perfect, but that our furnaces were burned out and destroyed in too short a time, and gave us a great deal of trouble; but that we were now steering clear of that by methods which we hoped would be effectual; and you should then go away from here, armed with that experience, and work on your furnaces with that one thing in view—of steering clear from that particular trouble—and in doing so got into another trouble, you would be only getting out of one trouble into another. Whereas, if we keep still as to our experiments until we have accomplished what we desire, and at the end give you the result of them all, you would then be able to steer clear of all trouble. I say, most decidedly, that I do not believe in giving the results of experiments until you get through with them, and are able to show that our results are good for something.

Mr. Stedman—I wish to ask Mr. Lamson how much deeper his furnaces were made.

Mr. Lamson—I did not make any statement at all about it.

Mr. Stedman—You said you had deepened the furnaces.

Mr. Lamson—Just now I said I had deepened the furnaces. The President asked me whether, if we were going to build a new stack of benches, we would build them so that we could use the patented furnaces of various kinds; and I said that if I was going to build a stack of benches for a large works, I should so build the bench that other furnaces could be adapted to the bench at any time. That is, that we should do the same as we had done the present year—build the foundations of the stack some 8 or 10 feet below the level of the floor.

Mr. Stedman—That is my point. I understood you to say that in experimenting with the Dieterich furnace you had deepened the furnaces.

Mr. Lamson—I have just said so now. We did deepen our furnaces a couple of feet.

Mr. Stedman—Then you have a depth of about 5 feet of combustible matter?

Mr. Lamson—It is 4 feet 11 inches; so that the coke can be put in from the grate bars to the flue leading into the setting.

Mr. Sherman—I would like to ask Mr. Starr how long he has been using the blast in his furnace.

Mr. Starr—I commenced to use it about the middle of November.

Mr. Sherman—Then you are not yet prepared to say what the effect will be upon the furnace?

Mr. Starr—It seems to have hurt it but little as yet.

Mr. Sherman—I do not know of anything that will stand such a heat as you speak of for any length of time.

Mr. Starr—Neither do I know of anything; it is only an experiment with me. On the top of this air box which we have round the ash pan, I have a casting 2½ high and 4 inches wide, which is hollow underneath; and the air goes up into that and goes out into the fire. I had calculated that the passage of air through would prevent that burning out. I had been using that for a number of years for another purpose. I have now constructed a grate bar by which, by using a lever, I have all the bars to move. One motion of the lever knocks the ashes out all over the grate bars. My trouble was to get the firemen to run their flat bar in and clear the ashes off; and so I constructed this lever, by means of which I can shake the bars all over.

I have on the outside an air hole, which allows the air to come in from the outside in front of the bench, and then go out through these holes in

the box. Those irons last for two or three years. They would get burned out finally. The lower box has never yet been burned out. I put the lower box in three or four years ago, and it is not yet injured. If I only used the top holes, and let the air come out above the fire, I think the box would last for years. I wish to inquire of Mr. Sherman, or Mr. Slater, or Mr. Stedman how much they keep the draught open at the top in using the Dieterich furnace, and in using the different furnaces. On our blast furnace we do not have it open over 1 inch.

Mr. Sherman—There are no two works that have the same draught. My friend Stedman has a very strong draught; I have short chimneys, while he has a chimney 80 feet high.

Mr. Starr—Do you not have short chimneys too?

Mr. Stedman—We have short chimneys on a bench that we sometimes use.

Mr. Starr—All of mine are short chimneys.

Mr. Sherman—Mine are about 9 inches square.

Mr. Starr—Open?

Mr. Sherman—At times they are open full, and at times, when the wind is in another direction, we close them.

Mr. Slater—We have short chimneys, but they are built a couple of feet higher than is usual. We have the upper dampers open from 6 to 8 inches.

Mr. Starr—That is about my experience. I have to have them open from 6 to 8 inches. It throws out a powerful blast, and the heat is wasted. My theory is that if I can cause the combustion inside of the bench, and not have it open to the draught more than 1 inch, there must be heat saved, and in this saving there must be a saving of coke.

Mr. Slater—We have very little flame from the chimneys except when we first used the furnaces. I should like to ask Mr. Cushing if he has flame issuing from the chimney tops.

Mr. Cushing—Very little indeed; there was a little when we first charged the furnaces, but ordinarily we can hardly see any flame.

Mr. Starr—I think that is evidence that if you have that open, and have a draught round the other furnaces, it must carry off a great deal more heat than it does when closed.

---

### Second Day—Feb. 16—Afternoon Session.

The President—The first subject for discussion this afternoon is "Ammoniacal Liquor; its Production and Utilization." I think Mr. Taber can give us some information on this subject.

Mr. Taber—I should be glad to speak on this subject if there was anything definite that I could state. I undertook the treatment of the ammoniacal liquor as an experimental business in connection with our works, to see whether something could not be done with it—hoping to secure results somewhat similar to those which have been obtained on the other side of the water. I can say that it is a matter requiring very little attention, and is very easily manipulated. It is a wonder to me that no more attention has been given to it in this country. The demand for it is now very great indeed.

Mr. Neal—Do you mean the manufacture of the sulphate of ammonia?

Mr. Taber—Yes; the demand for the sulphate is very good. I speak of that more particularly, because gentlemen might inquire whether, when they have manufactured it, a ready sale of it can be made. It is very easily sold; there is plenty of demand for it at the present time. The plant is not at all expensive; a simple boiler with an evaporating tank and a mixer is all that is required. Any ordinary workman will be able to carry on the business successfully. The principal difficulty, of course, is in the economy of the labor. If there is sufficient liquor obtained, one man—or at the utmost two men—can do all that is required to secure satisfactory results. But, of course, if it requires one man all the time, the man's wages may eat up all the profits.

The President—What amount of liquor do you consider two men could handle economically?

Mr. Tabor—I think they could handle 20 or 25 barrels per day. They would probably neutralize two or three carboys of 500 pounds of sulphuric acid, and the result will be a little more than that of the sulphate of ammonia.

Mr. Stiness—What is the cost of sulphuric acid at the present time?

Mr. Taber—There are two qualities of sulphuric acid used in the manufacture; one is the oil of vitriol, and the other is the weaker acid, which comes cheaper. I find that the latter suits my purposes just as well as the other. For that I pay about $20 per ton.

Mr. Stiness—What does the sulphate of ammonia sell for per pound?

Mr. Taber—From 4 to 4½ cents.

Mr. Greenough—Do you find that it costs more to produce the sulphate of ammonia than you can sell it for?

Mr. Taber—At one time we had quite a demand for the ammoniacal liquor; but after going to the expense of building a tank and providing everything ready for the customer, he suddenly gave it up; and we allowed the ammonia to run into the dock. That was to us a nuisance, because the parties owning the next wharf made complaint; and I then took this matter up, partially to relieve ourselves from the nuisance. I find that I can get a dollar back for a dollar spent, and relieve ourselves of the nuisance. I have not paid sufficient personal attention to it to be able to give you all the data I desire. I cannot state what I net per ton of coal. I have seen figures on the other side of the water during the summer which are surprising as to the amount of profit they can make there.

Major Dresser—How many pounds of sulphate do you average to the ton of coal carbonized?

Mr. Taber—I cannot tell you that. We simply do it to relieve ourselves of the nuisance. The weak ammonia water, which is only perhaps 1° or 1½°, runs into the dock.

Mr. Neal—I would like to hear the results which Mr. Greenough has obtained.

Mr Greenough—I have no results to give of the utilization of the ammoniacal liquor. Very likely there are other gentlemen here who have had longer experience. We have sold our ammoniacal liquor for the last two years at so much per ton of coal carbonized, and are selling the water that comes from the washers at so much per gallon of 16-ounce strength—not furnishing it at 16-ounce, but being paid for it at that rate. The water is tested as it is taken away, and reduced to 16-ounce strength. The price that was offered us at first was 10 cents per ton of coal carbonized. I think that there is no difficulty, with a good washer, in getting fully 10 cents for the ammoniacal liquor from the washers, besides the 4 cents that we get from the hydraulic main and condenser water. During the past year we have done better than that. I have no doubt that if the contract were renewed at the present time we could get considerably more. I think that anyone who is in the position of making ammoniacal liquor of good strength can sell it to-day at a very good price. Of course it is not so much as they can get on the other side of the water. I think it is said that there they get 75 cents back per ton of coal carbonized. If we can get 50 cents here we will be doing pretty well.

Mr. Starr—How much do you get per barrel for the water at 16-ounce strength?

Mr. Greenough—I recollect what the price is.

Mr. Starr—How much is it?

Mr. Greenough—I do not mention it. (Laughter.)

Mr. Starr—That is just what I am here for; I want to find that out also. I am to rebuild my works, and I want to put in Kirkham's washer. They tell me I can get any strength that I want up to 30. I have to ship it 70 miles, but I want to know if I can get it up to a strength which will pay me for shipping it to Cincinnati to be manufactured. That is the reason that I asked the question.

Mr. Greenough—I do not want to be at all discourteous in my answer to your question. The contract was, of course, a private one, and I do not want to state publicly just what we get; but I will say, without hesitation, that I think there is no doubt about your being able to get 1 cent per gallon for 16-ounce liquor.

Mr. Starr—That would convince me that I do not want it. It costs 40 cents per barrel to ship it to Cincinnati. If I only get that price I do not want to ship it. I was getting at that knowledge by degrees in talking with other parties; and I am about decided that it will not pay me to accept this washer for the sake of selling the liquor—not that kind of liquor, anyhow.

Mr. Allyn—I would like to ask Mr. Taber whether he strengthened his liquor in any way.

Mr. Taber—No; this is simply the water from the hydraulic main.

Major Dresser—Mr. Taber has referred to the habit on the other side of making this saving. I was very glad to hear him make the statement that rather than allow a waste which would cause a nuisance, if he could get a new dollar for an old dollar, even though he made no profit out of it, he was perfectly well satisfied with the results. I think that is very much better business management than it is to allow anything to go to waste. The practice with many of the small works in England is to have a tank in which they can accumulate their ammoniacal liquor, until they get a good quantity of it on hand. They have a very simple apparatus which requires very little skill in manipulation; and when they get their tank full they start their sulphate apparatus and work off that quantity of liquor. It may take them two or three days, or it may take them a week to do it. Then they may not work the apparatus again for a month; but that is dependent upon the size of the works. They propose to save whatever there is in it, and they do it in that way. The wages of the men who are employed in this part of the business are not necessarily continuous wages to be charged to this thing the year round, because they may have men who, at other times, attend to other things. There are a great many small works which in the summer time would run one or two benches of fives or sixes, which make a

practice of saving the liquor in this way. The sulphate is quoted on the other side at about $100 per ton. I suppose the average price for the acid is from ¾ to 1 cent per pound. They are able to make a profit from this thing. There is no reason in the world why the managers of small works in this country should not do the same thing, instead of letting this product, which is more or less valuable according to the condition of the market, go to waste or run into the rivers and make a nuisance to the works and to the neighbors, and bring discredit to the company by laying it open to the charge of bad or wasteful management. Even if you can simply get a new dollar back for the old one it is better to do it and work up this product, and find out what the value of it is by practical trial. It is not an expensive plant or a difficult process to carry on. I think that there is plenty of encouragement for even the smallest establishments, much more the larger ones, to go into this thing; and the managers of the larger works ought to have time enough to look after it and keep the thing running without difficulty. It may be more profitable to the larger works, when they have liquor enough to make it an object to the manufacturers to buy it, to sell the liquor. As the business is carried on to-day in New York, the manufacturers of the sulphate will get from 20 to 23 pounds of the sulphate per ton of coal carbonized by the establishments from which they get their liquor. That is about what there is in it; and it is simply a question of the cost of the acid and labor, and what you can get for it, as to whether it can be done with a reasonable profit.

Mr. Neal—I have at intervals sold the ammoniacal liquor at the rate of ¼ cent per gallon for 4-ounce liquor, and so on up, according to the strength. I have sold considerable of it at different times. There is one cent rebate, because two cents per barrel is charged for transportation by the parties who take it. A firm are now building works, at the gas works under my charge, with the intention of manufacturing the sulphate of ammonia; and they have talked of paying 15 cents per ton of coal carbonized for 8-ounce liquor. Whether they will pay that or not I do not know. It may be an experiment with them, and it may not succeed. If it does not, then I shall strengthen the liquor and sell it to the parties who have taken it before. I have a scrubber which is insufficient for the purpose, and I have been sending gas into the purifiers charged with 100 grains of ammonia, in order to carry up the strength of the liquor. That is not a good plan, because it works the purifiers too hard, and the iron sponge does not last so long. The ammoniacal liquor is pumped over and over again from the larger tank into the scrubber, and the strength is brought up as high as it will bear. When it is 5-ounce strength, that is too much, and there is then too much ammonia passing over into the purifiers. I have not yet got a suitable scrubber, but hope to have one before long, in order to utilize the ammoniacal liquor and make it strong enough to be sold at a profit.

Mr. Rollins—We have been making a change with regard to the disposition of our ammoniacal water, and have made a contract with New York parties for five years; and they are now about completing their arrangements for manufacturing it in our yard—that is, for making the sulphate. The expense of the arrangement which they have put in there will not exceed $1,500. For our works—and using the water of 5,000 tons or upward per year—I suppose they think it will pay them to do it at the price they pay. We agree to furnish the liquor at 8-ounce strength. From what I have seen since they commenced, I think it is likely that some companies who are making less water than we are, will find that it will pay them to put up a small apparatus and manufacture the sulphate themselves. I have learned considerable about it in the last three months. If I knew four months ago what I do now, I do not think I should make a contract to sell the liquor, but would put up some works and take the chance of selling the sulphate.

Mr. Greenough—What do you think is the value of the ammoniacal liquor per ton of coal carbonized? What do you think you could net by it if you manufactured the sulphate yourself?

Mr. Rollins—I should not want to say, because we have made a contract for five years, and I am not at liberty to state the price. If I were to state what I could get out of it, I would be giving the price away.

Mr. Greenough—It is considerably more than 10 cents per ton of coal carbonized?

Mr. Rollins—Yes; it is more than 10 cents per ton.

Mr. Neal—I was looking over the papers of the Association yesterday, and I found one that was prepared by Mr. Sherman, giving the results of his experiments in the manufacture of the sulphate of ammonia at the Worcester works. He tried it, and gave it up; and I asked him why he did not succeed, and he said that it was because the sulphuric acid was so high that he could not make it pay.

Mr. Rollins—Mr. Sherman is not here, but the gentleman is here who manufactured the sulphate from the water for him at that time, and perhaps knew about the manufacture. I refer to Mr. Todd.

Mr. Neal—The result was that it did not pay, and so he abandoned it?

Mr. Todd—I have just come in, and have not heard the discussion that has taken place. I heard someone say that the apparatus could be put up in any works very cheaply. In Worcester we use a hogshead with a lead pipe inside of it, and run the steam through it from the vat. The vat was within four feet. If Mr. Sherman were here I think he would say that if we could have bought the acid here for what it is now selling, and sold it for double the price they do in London, we could have sold it at a profit. Mr. Sherman then paid 3 cents per pound for the acid. If we could have bought it for 2 cents a pound we might have made a profit. The crystals that we made were very white and well formed. As Mr. Sherman has come in, I will leave him to state the result of the experiment.

Mr. Sherman—Mr. Todd had charge of the ammonia works at Worcester at that time, and I think he has stated the case as it then existed. The conditions of the market are altogether different at the present time. We could only get 4½ cents per pound for the manufactured product at that time; and we were buying the acid at retail at an apothecary store. Of course, under such circumstances, we could not compete with our English cousins, who were buying the acid at that time for $14 per ton, while we were paying about $60 per ton. Under these conditions the business was about on an even beam. The conditions which now prevail are entirely different. Acid can be now bought for 1 cent per pound, and the manufactured product at the present time brings 5 cents. There is no reason why the business should not be carried on by any gas company at a profit under the present conditions of the market. There is no great secret in the business. Anybody can take it up and carry it on successfully. All that we knew about it was what we had read in the English journals. We had nobody to start us in the business; and we made as many pounds of the manufactured article, with our crude and home-made apparatus, as they did abroad.

Mr. Stiness—How many pounds of the sulphate of ammonia can be made from a gallon of liquor of 8 or 10 ounce strength?

Mr. Sherman—At the present time we are not satisfied with less than 20 pounds of sulphate to the ton of coal. I do not know that they have any better apparatus than we have. In our works, at the present time, we have a contract with parties in New York; and they make 20 pounds to the ton.

Mr. Cabot—What is the basis of your contract with them?

Mr. Sherman—So much per ton of coal. Unfortunately for us, our contract was made when everything was down low. If we made a contract at the present time we could get more than 10 per cent. advance on the rates we are now obtaining for our liquor.

Mr. Cabot—What do you think it is worth to-day?

Mr. Sherman—It is worth one price in New York, and another price in a country town fifty miles from the seaboard. Contracts are being made in New York at 25 cents.

Mr. Cabot—Are you required to furnish liquor of a certain standard strength?

Mr. Sherman—Yes; our contract calls for 8-ounce liquor. It is generally a little above that.

Mr. Neal—Mr. Sherman says that contracts have been made in the vicinity of New York for 25 cents per ton of coal carbonized. I think that within two months I have been told that contracts for five years have been made at the rate of 27 cents a ton for 4 ounce liquor. There is no gentleman in New England that I have heard of who is getting more than 10 cents per ton.

Mr. Sherman—I think that Mr. Rollins is getting more than that at the present time.

The President—But that is on a recent contract.

Mr. Greenough—We are getting more than 10 cents per ton for our washer water, besides what we get from the ammoniacal liquor. Our ammonia water netted us last year very nearly 17 cents per ton. I have no doubt that if the contract were made at the present rates, and by the strength of the liquor furnished, 25 cents could be obtained, although I do not know that any contract has been made at that rate. If it can be made at 25 cents per ton of coal carbonized, and sold on the strength of the water delivered, I believe that we could get more than that sum. If 25 cents can be got, amounting to 2½ cents per 1,000 feet of gas made, I think it would pay any moderate sized company to look after it.

The President—In Providence we commenced to sell our ammonia water 18 years ago. Previous to that time we gave it away; that is to say, we gave it to Pawtucket parties for purposes of experiment, if they would take it away. After experimenting for a sufficient length of time, they found that they could make something out of it, and then we made a contract with them for three years. At the present time the contract is for one year. I do not think it nets us over 5 or 6 cents per ton. I see that we are behind the times. Someone has suggested that Mr. Cushing can give us some information.

Mr. Cushing—I sell my ammoniacal liquor in a lump, at so much per year. We do not manufacture a great deal, and we make a weak liquor. I hope there will be some discovery which will enable me to sell a standard liquor at a reasonable profit.

Mr. Neal—I think that the value of ammoniacal liquor is appreciating, because the last bid made by the party who takes away our ammoniacal liquor was a quarter of a cent for 4-ounce liquor, and he to do the teaming. Before that we paid 2 cents per barrel for the teaming. I am of opinion, therefore, that it is growing more valuable, and I am glad to know it.

Mr. Sherman—I understand that they get 65 cents per ton in Leeds. Can Major Dresser tell us how that is?

Major Dresser—They get their acid very cheap, and they have a class of coal that gives a large yield of ammonia. Another thing to which they attribute much of their success is the fact that they were among the first, and are at the present time, very extensive users of the Hulett "standard" scrubber. Mr. Woodall, who is at the head of the establishment, does not hesitate to attribute to that scrubber a very large increase in the receipts for the ammoniacal liquor.

Mr. Harbison—Is he interested in the manufacture and sale of the scrubber?

Major Dresser—He is not; nor in anything else which he recommends. He is as straight a man as there is on the face of the earth.

Mr. Sherman—You know what they are doing in New York with the tower scrubbers. Is it violating any secrecy to ask you to express your opinion about the Hewlett and the tower scrubbers? So far as I am informed as to the results obtained at the Manhattan works, there is no difference.

Major Dresser—I understand that since those tower scrubbers were started they have run without expense. I believe they painted them once on the outside. They get from the scrubbers an average of 14 or 15 ounce liquor simply by the use of 1¼ gallons of water to the 1,000 feet of gas.

Mr. Sherman—One of our members is using the Kirkham, Hulett & Chandler scrubber. What does our friend from Newport say about that? The tower scrubber can be erected at a very much less expense; and, if they are just as efficient, it would hardly seem that a gas company is warranted in going to the great expense of buying a foreign article when they can have a boiler maker set up in their own works a tower scrubber which will do as good work as the Manhattan Company do with their scrubber, and at less than half the expense charged for the "standard" scrubber. At least, that is my experience.

Mr. Neal—There is another scrubber—the zigzag—used by Mr. Yorke, which is said to be very good. It is very simple in its construction, and is not at all expensive. I would like to hear from that.

Mr. Sherman—I have had no experience with the English scrubber; but if we can judge of it by the results at the Manhattan works with the towers, it would hardly seem necessary to pay the prices which are asked for the "standard" scrubber.

Mr. Neal—I was told that that was a most expensive scrubber used at the Manhattan works—that it was much more expensive than the "standard" scrubber. I have been making some inquiries, with a view to putting up a new scrubber.

Mr. Taber—Does any gentleman know whether it is necessary that the condensation should be perfect whenever a Kirkham, Hulett & Chandler scrubber is employed? I have been given to understand that that is absolutely essential.

Mr. Sherman—Of course, as there is no patent on the tower scrubber, anybody can make it and use it. I am not here as the advocate of any patent, or of anything which any member here cannot adopt without expense for royalty. The only question with me is, which is the best scrubber. We want the best, if we can determine which it is. If it can be shown that we are losing money by using the one that we have, I am ready to take it out and put in the latest improvement.

Mr. Neal—What is yours?

Mr. Sherman—Ours is the tower scrubber.

Major Dresser—In reply to Mr. Taber, I will say that in any well regulated works it is not fair to ask the apparatus which is designed for extracting the ammonia to take out the tar also. The two operations are entirely distinct. It is in this regard that they have a great deal of trouble in England. In some works they are deficient in their condensation. An inquiry has just been started by the Gas Institute with a view to finding out where the trouble in condensation is, and what is the best way to remedy it. I am very confident that you ought to get the tar out of the gas before you start to completely remove your ammonia. There is no question about that. If your condensation is properly arranged there will be no trouble from tar in the ammonia scrubber. With reference to the Kirkham, Hulett & Chandler scrubber, I will say that Mr. Kirkham told me that they had had trouble in a good many works in removing all the tar before the gas arrived at the towers or other scrubbers; and that a number of gas engineers had asked him to introduce into the first portion of his scrubber some sort of an arrangement which would knock down whatever tar came forward to that part of the apparatus. But that was asking the scrubber to do work which it was never designed to do; and the same remark would apply to any apparatus. If you get your scrubber full of tar, of course it will not do its work so well as it will if it has simply to absorb the ammonia. As to the relative advantages of the tower scrubber and the rotary or "standard" scrubber, it seems to me that the question is about as broad as it is long. It depends largely upon the location of the works and the circumstances under which the manager is placed. You must present a certain amount of wet surface to your gas, proportioned to the amount of gas which you are making, in order to remove the ammonia from the gas. Whether that wet surface is presented in the form of a tower filled with slats, or in the form of revolving disks, it has the same effect and the same result is obtained. It is necessary to have power constantly applied in order to keep the "standard" scrubber in rotation. To many that is not an objection; to others it is. With the tower scrubber it is easy to arrange the distribution of the water in such a way that there is no power required about the tower, so that all that you have to do is to pump the water into the tank upon the top of it, and then it is self-acting and self-regulating. The towers at the Manhattan works are run from year to year; and the only attention they have is that a man goes to the top of them every day and dusts them off, and sees that the water is running in the proper amount according to the quantity of gas they are making at the time. As the make of gas is changed the quantity of water is changed. Aside from that they require no attendance and no attention. I saw those scrubbers opened after they had been working year, and they were just as clean as they were the day they were started; but they had taken care to prevent the finely divided tar, or any other kind of tar, from getting into the scrubbers by the introduction of a zigzag tar scrubber, between the condenser and the tower. When they put those zigzags in, they reduced the quantity of tar at the exhauster drip from 8 barrels to less than half a barrel per day. No tar has passed the exhauster, which is between the zigzag and the towers, since that. The point which Mr. Taber makes is a very important one in the arrangement of any apparatus for removing the ammonia, because if you get your ammoniacal liquor full of tar (as it will be if it is let into your scrubber) you will have as the result part tar and part ammoniacal liquor. It is not good management to ask the ammonia scrubber to do the work of the scrubber. I have never heard of any failure with the Kirkham, Hulett & Chandler apparatus; but, on the other hand, it is highly commended by those using it.

Mr. Taber—The Association will absolve me from any attempt to condemn the "standard" scrubber. I well remember while in London seeing tower scrubbers opened which were covered with tar. In one place they were taking out the tower scrubber and introducing the "standard." I asked the gentleman who was with me why they were doing that, and he said that they could not keep the tower scrubber from becoming clogged up with tar. In conversation with Mr. Smith, in the Manhattan works, on the same subject, he told me that the extra precautions which they had adopted to take all the tar from the gas gave them very good results. He said that upon opening the scrubber, after it had run a year and a day, he found everything perfectly clean.

The President—It has been stated that a new scrubber has recently been put in, in South Boston, by Mr. Jones. We would like to hear from him how it works.

Mr. Jones—The zigzag scrubber differs from the others in having the air pass between the inner shell of the scrubber and the outside sheet iron shell, which does not allow any heat in the summer, or any artificial heat in the winter, to reach the inside core of the scrubber. We are selling our ammoniacal liquor at present, and realizing about five cents per ton. It is not a large figure for it, and some other gentlemen are getting more; but we are able to keep our ammonia down very low. At the outlet of that scrubber we have been unable to get a test of more than two grains of ammonia. The report of the State Inspector shows that we have five grains in the street main. By experiments taken at the works we found that the ammonia was taken up in passing from the scrubber to the street, and that some of the ammonia in the street main was taken from the water in the gasometer tank, which I tested and found to be half-ounce liquor. The ammonia was given up to the gas in passing through the apparatus. Is not that so, Major Dresser?

Major Dresser—If you found half-ounce liquor in your tank, I have no doubt of it; but it is more likely that there are some of the compounds of ammonium, which are not soluble in water, which passed your scrubber and went on to your purifiers, and that there, in the decomposition which goes on in the purifier, either from heat or from some other cause, these ammonium compounds are broken up and the ammonia set free; so that after leaving your purifiers, you would find a small amount of ammonia in your gas. That does sometimes happen. The commercial value of that ammonia is, however, so small that it is hardly worth while to save it; although it could be very easily saved by putting a small spray of water in the pipe leading to the meter, and then letting that water run out as a weak liquor, or by using a small "standard" scrubber. You can very easily do that if you are troubled by your Gas Inspector. It is undoubtedly some

of those insoluble compounds of ammonium passing through which are afterwards broken up in purification, and which give free ammonia in that way. That causes the appearance of ammonia in the street gas, although none could be found at the scrubber outlet.

Mr. Jones—We are using the Davis & Farnum brush scrubber, and the Jones scrubber is placed after that, so that we can get the ammoniacal liquor at sixteen ounce strength without carrying over the ammonia to our purifiers.

Mr. Allyn—Major Dresser's theory may be the correct one; but I am inclined to accept the one suggested by Mr. Jones. I remember having a conversation with the late State Inspector some years ago in relation to this matter. He stated that in testing the gas at the Boston works he had found, as a general rule, much less ammonia than he did when testing at his office about one mile distant; and he offered the same explanation that Mr. Jones has given—that the gas, while lying in the holder, absorbed some of the ammonia that was held in suspension in the foul water in the holder tank.

Major Dresser—How did the water in the tank get its ammmonia?

The President—We would like to hear from Mr. York as to his friction scrubber.

Mr Yorke—I am asked to say something about the friction candenser that we are using. I can simply state that several years ago we were using the old style of condenser. The scrubber was a cylinder seven feet in diameter and twelve feet high. We then had a large amount of tar pass through to the purifiers. It seemed to thoroughly cool the gas, but it did not take out the tar. We finally got one of the sinuous condensers, and used it simply as a scrubber and condenser. I am unable to state the amount of water that we use per thousand feet of gas; it was, however, very small. Our ammonia is usually from 5 to 8 or 9 grains.

The President—In the street gas?

Mr. Yorke—In the gas from the holder. It is very often down as low as 7. If we are careless about the water we will sometimes find it up to 12 or 14 grains. I am pretty well satisfied that simply cooling the gas does not take out the tar. In the sinuous condenser there are a great many angles upon which the gas impinges, and I think it is the beating of the gas that takes out the tar. I am entirely satisfied that simply cooling the gas does not take out the tar, because I know that formerly our gas was thoroughly cooled, and we could dip up the tar by bucketfuls in the purifiers. I have seen it 3 inches deep in the bottom. Now we have no tar in the purifiers.

### GAS FOR FUEL.

The President—The next subject for discussion is gas for fuel. I suppose this is understood to refer to the use of gas for heating, cooking, driving engines, etc. I think that Mr. Taber has had some experience in the use of stoves for cooking and heating. Perhaps he will give us the benefit of his experience.

Mr. Taber—From our experience of the past year in New Bedford, I think I can safely say that the introduction of gas for cooking and heating—more especially for cooking—has been a decided success. We have been unable in our rather quiet town to sell many of the stoves. In fact I think the demand for stoves is very limited indeed. However, we early adopted the practice of renting stoves and in that hoped to get back a profit from the sale of the gas. Last year, if I remember rightly, we were able to rent and sell 115 or 120 stoves. Of course, I do not make any account of the smaller stoves that are used in nurseries. I refer only to the larger sizes of stoves, particularly to those like Goodwin's No. 7, and the range stove. We have been able to rent many of those. We take the precaution in each case to send a man to connect with iron pipe directly to the stove. That is done without charge. I think we have thus been able to sell, in a year, from a million and a quarter to a million and a half feet of gas. It increased the sales very materially, and we found, to our very great pleasure, that when winter came the parties who had been using the gas stoves during the summer were desirous of retaining them in the same places during the winter. We find that it is not regarded as a stove to be sent up-stairs at the end of the season, but that those who began to use it in the summer continued to use it during the winter. It was a matter of surprise to us that as a matter of fact we had from six to ten persons who use the gas entirely for stoves; that is their only use of it. Of course, the sale of gas stoves may be a very small item, but I think it is well worth the attention of every gas engineer to see if, by any means, the demand for gas cannot be increased during the summer. The people who have taken the stoves like them very much. We have had bills of ten and twelve dollars per quarter paid much more willingly in summer for gas which was used for cooking purposes than during the winter for lighting. The people are very well satisfied with this use of gas. The stoves work well and are easily managed, and we are heartily in favor of continuing the same plan during the succeeding years.

The President—You have no complaints about the stoves working unsatisfactorily?

Mr. Taber—We have had no complaints whatever. We have had only expressions of great satisfaction from our customers. We have the stoves in our office so as to show every one who comes in just how we use them; and the man who goes out to set them up still further explains them. The only further improvement that I could suggest would be to send a good cook round to the renters to prepare a few dishes so as to show the mistress of the house how it is done. I think if we did that we could dispose of as many gas stoves as there is room for. In sending round our annual circulars to gas consumers, I made it a special point of recommendation that all pipes leading to kitchens should be a half inch in diameter so as to allow for the gas stoves which, I am satisfied, will be introduced by-and-by.

Mr. Allyn—What is your system of renting?

Mr. Taber—We charge just as little as possible for rents. I think we charge about ten or twelve per cent. on the selling price of the stove per year. It is not our expectation to make any money on the rents.

Mr. Harbison—A year ago, I stated what our experience in gas stoves had been up to that time; and we have continued our efforts in that direction during the past year with very satisfactory results to us as well as to those to whom we have sold stoves. We do not, however, follow Mr. Taber's plan of loaning or renting the stoves. We sell them at net cost, charge for the time of the man that does the work of putting them up, and for the material used in making the connection. In every case we make the connection with iron pipe. The results have been very satisfactory. We have had some very careful tests made, by people who bought the stoves, before purchasing. We have said to parties who came with a view of purchasing stoves, "We will put a stove in your place, and you shall be the judge as to whether our statements are correct. If the trial does not verify our statements we will take the stove away without any expense to you." One of our leading restaurant keepers made such a test, and on a No. 8 Goodwin stove; and his wife, who superintended the operation, said that the steak cooked on the gas stove was the best she had ever tasted, and that it had been broiled without using a particle of butter. She said that if she had used butter it would have cost three cents for that steak, and that the steak was very much better than it would have been if she had used butter and cooked it upon the range in the old style.

After experimenting two or three days with a No. 8 stove, he gave me an order for a No. 10, which is now in daily operation at his restaurant. We set a meter to measure the gas that was used in experimenting with the No. 8, and he was entirely satisfied with the result. I made a statement to him before we put in the No. 8, that if he did not save enough in the weight of the meat cooked and in the fuel used, as compared with the old way of cooking, we would give him the gas and the stove. We set the meter to make the test by, and he was so well satisfied with the result that he gave me an order for a No. 10 stove, and has it now in use. That was an experiment made by a man who is abundantly capable of determining the utility of the stove. I do not quite agree with the suggestion that has been made here that it would be well to send a cook around to give lessons in cooking. The lady of the house always thinks that she knows all about it herself. But we have a young man in our office who is quite an expert in manipulating the gas stove and the articles that may be cooked on it, and he has occasionally, in a very quiet and gentlemanly way, made suggestions to people who at first had difficulty with their stoves, and they were able to overcome the difficulties in every case. We have now in Hartford about 150 stoves in use, with great success and satisfaction to the people. Where purchasers failed to make biscuits the first time successfully, he has carried the dough from his own house to the office, and there cooked biscuits and shown the operation to the parties who had been unsuccessful in doing it. The sale of stoves is continually on the increase, and we have a large increase in the consumption of gas as the result. It is a great point for us to bear in mind that we want to increase the sale of gas in the daytime as well as in the evening. This we are able to do by the introduction of gas stoves. We have made a special effort, and have succeeded in it, in inducing one party to consent to use a gas engine. I learned the other day that one of our large insurance companies, who do their own printing, were about putting in a new engine to replace one which had been used up. They had failed to make a satisfactory arrangement with one steam company for the supply of steam, and I suggested to them that they had better give up the use of steam entirely, and try gas. They rather laughed at the idea at first, but I made a statement to them with regard to what the Otto engine would do; and I finally offered to furnish a 4-horse power Otto engine, put it in their place, make the connections, put in a meter to measure the gas, and let them run it for three months; and then if they were not satisfied with the results to take out the engine. I have ordered the engine for the printing room of the insurance building, and in three or four months we shall know the result of the experiment. I believe that it will be entirely satisfactory. I have confidence enough in the engine to order it at our own risk, and we believe that they will continue its use when the three months are up. We believe there is a profitable business for us in that direction.

Mr. Taber—During the last July we sold fifteen per cent. of our gas in the daytime.

Mr. Starr—I have had some experience with gas engines, but have found them rather troublesome from a want of knowledge how to operate them. A man had one set up and it ran first rate for a month, and then it just died down. Nothing that we could do to it could make it work. The man got out of patience with it and finally sent it back to Philadelphia, where it was repaired, put in order and sent back. It ran for another month, and then it died down again. We could not do anything with it; it took a steam engine to start it. I then had a man from Indianapolis come over and fix it and show us what was wanting. He fixed it, and showed us what to do with it, and how to clean it; and, since then, it has been the most beautiful thing to run I have ever seen. We have now learned how to take care of it. If you have any trouble with them you had better send to Philadelphia and have a man come and fix them. There is in it one little orifice that we didn't seem able to regulate properly. Although we thought we cleaned it thoroughly, we did not touch the sore spot. It is now cleaned regularly once a week and there is no prettier power used. They run three presses in that printing office. They run a great deal at night. In one week it was run seventy hours. The bill for gas for that month was $28. It is a job office, and they have a large amount of presswork. It is a four-horse power engine. The price of our gas is two dollars.

We commenced cooking with gas twelve years ago, and our town is thoroughly in favor of gas stoves. They give entire satisfaction. We commenced at first with the small gas stoves, with which you can cook a meal for five or six persons at a cent and a-half. It would only cost $1.50 a month to run them. Since they have brought out the gas ranges and Goodwin stoves I have been introducing them, and expect this year to dispose of 300 of them. The cost of cooking on them varies from $2 to $3 50 per month. One of the largest families in our town, and the one which, as I suppose, lives the best, uses a gas cooking stove. They were among the first to use them. I put up a stove for them, and set a meter to measure the gas, and the bill for the first month was $2.20, for the second month, $2.50, and for the last month $3.20. That is the largest bill we have had. We are selling stoves to a great many, who use them right through the winter, dispensing with the old cooking stove entirely, and using gas for cooking through the whole year.

### THE "STANDARD" SCRUBBER.

Mr. Harbison—Mr. Stedman was not in the room, I think, when we were discussing the "standard" scrubber, and I would like to hear a statement of his experience in its use.

Mr. Stedman—The scrubber continues to give us the same satisfaction as I expressed when I was here a year ago. It has done uniformly good work. It has never shown the slighest indication of producing any back pressure or any clogging in any way. Whenever we can control the temperature so as to keep the gas and water at about 60°, we can easily get 13 or 15 ounce liquor. When the temperature of the water is higher (and as we have air condensers we can bring the temperature of the gas down no lower than that of the surrounding atmosphere in the summer) we get about 8 to 10 ounce liquor, for the reason that we have to use a larger quantity of water to absorb the ammonia than we do at times when the temperature of the liquor and gas is lower. The scrubber continues to work as easily, and to require as little power to turn it, as at first. It makes about five revolutions per minute. It is really very efficient and gives us no manner of anxiety or concern about its working.

The President—Do you find any accumulation of tar in the cells or discs?

Mr. Stedman—After running about four months we decided to add additional chambers. We started about the 1st of February last. We opened it in June, because they had to put on an additional length of shaft. To my great surprise there was not the slightest appearance of the accumulation of tar on the discs. They appeared to be as clean as the day they were put in, with the single exception of a little symptom of rust which had accumulated. But in the spaces between the discs in the chambers there was no appearance of tar. Neither was there any accumulation of tar in the bottom of the chambers, excepting in one corner where the agitation of the water had gradually lodged it. It had accumulated to the depth of an inch or two there, where the disc, in revolving, did not touch it. That was only on one side of the scrubber. We have provided means to draw that off, by means of holes tapped in the bottom of the scrubber, and stop-cocks attached thereto.

Mr. Allyn—What disposition do you make of your tar product?

Mr. Stedman—We put it into the Harbor.

Major Dresser—Wicked man!

Mr. Stedman—I know that it is wicked to throw away that which has any value as a chemical product or as a fertilizing agent; but we have not seen our way clear to put up works to use so small a product as we produce; and the only manufacturer there has not, until recently, seemed eager to take our product because of the expense of transporting it to his place. Recently, however, he has engaged 100 barrels to be carted to his place in order that he may test it and find out how much he could pay for it. If his experiment is successful, and he can offer enough to make it an object, we shall probably have a steady market for all that we may produce hereafter. The fact that it is a waste to throw it overboard is evinced by the fact that Mr. Thomas, of the Williamsburg works, in Brooklyn, who has recently put in a scrubber like ours, has, as I understand, recently made a contract for the disposition of all his ammoniacal liquor at the rate of 27 cents per ton of coal carbonized. If the manufacturers of the ammonia products in that vicinity can afford to pay that amount we certainly ought to expect, in the very near future, to get a pretty good price for a good article of ammoniacal liquor. Of course, those who have to transport the liquor can obtain more satisfactory results if they can so condense the liquor as to furnish the maximum of ammonia with the minimum of water.

The Association then adjourned, the President having announced that the banquet would take place at four o'clock that day, and that the members were invited to meet at ten o'clock, A.M., the next day, and visit the Boston Gas Works. This visit was entirely informal, and was much enjoyed by those who were present.

---

[From the London "Journal of Gas Lighting."]

## On the Determination of Sulphur in Coal.

By GREVILLE WILLIAMS, F.R.S., and HAMILTON DOVE.

All chemists who have had occasion to determine sulphur in coal by deflagration are aware that the use of gas lamps introduces an error; the sulphur contained in the gas combining with the alkaline mixture. Nakamura's method, (*Jour. Chem. Soc.*, Dec., 1879,) so highly recommended by Mr. Lewis T. Wright, (*Journal*, Vol. xxxviii., p. 796,) is also liable to error under the same circumstances; for although the temperature used is lower than with deflagrations, it is continued for a longer time.

As it was necessary, in some sulphur estimations which we had to make to attain the utmost possible accuracy we resolved to submit the Nakamura and deflagration methods to a rigid comparison, and also to ascertain the amount of error introduced into sulphur determinations by the use of gas.

*Deflagrations over Gas.*—In these experiments, 10 grains of Peareth coal in very fine powder were mixed with 40 grains of carbonate of sodium, 80 grains of nitrate of potassium, and 100 grains of chloride of sodium. All the reagents were tested before being used, and were found to be absolutely free from sulphuric acid.

The mixture was introduced in very small portions into a red-hot platinum crucible, the lid being only raised momentarily, and immediately replaced to prevent spurting. After each addition of the mixture the reaction was allowed to cease before any more was added. When cold, the crucible was placed in an inverted position in a beaker of hot water, and warmed over a small flame until the contents were dissolved. This inversion of the crucible is of importance if rapidity be desired, as was particularly the case with us, since we specially wished to ascertain the difference of time required for the two processes. The crucible was then removed and carefully washed into the beaker, a clock glass was placed over the latter, convex side downwards, and dilute hydrochloric acid carefully added, every precaution being taken against loss by spurting. This was continued until the acid was in excess. The solution was then filtered, the filter thoroughly washed, and the whole precipitated at a boiling heat with a measured quantity of chloride of barium solution of known strength, boiled for half an hour, and allowed to remain until the next day. The sulphate of barium was filtered through a Swedish filter yielding a known weight of ash. The precipitate was washed with boiling distilled water until not a trace of cloudiness was obtained on testing the washings with sulphuric acid for three minutes in a ¾-inch test-tube. These details may appear somewhat minute for so simple an operation, but it is only by a close adherence to rule that strictly comparative results can be obtained:

| Percentage of Sulphur by Deflagration over Gas Flame. | Time occupied in Deflagration. |
|---|---|
| 1.98 | 25 minutes. |
| 2.10 | " |
| 2.05 | " |
| 2.21 | " |
| 2.13 | " |

These numbers, it will be observed, agree fairly well; they are nevertheless entirely incorrect, as we shall show further on.

*Nakamura's Process over Gas.*—Having reason to believe that the above numbers were too high, and that their approximation to each other only arose from the exact similarity of the conditions under which they were made, especially with regard to time over the gas lamp, we determined to make a series of experiments by Nakamura's method over gas, taking different lengths of time to effect the oxidation. In this process, 10 grains of

the coal in fine powder are mixed with 40 grains of carbonate of sodium, and the mixture is heated very gently in a platinum capsule. If the heat be kept very low at first, and raised very gently, the sulphur is not driven off, but becomes oxidized into sulphuric acid, which combines with the sodium. In this manner the following results were obtained in a platinum capsule 2 inches in diameter and 1 inch deep:

| Percentage of sulphur by Nakamura's Method over Gas in Platinum Capsule. | Time Occupied in Oxidation. |
|---|---|
| 1.99 | 2 h. 35 m. |
| 2.68 | 13 h. 00 m. |

The result is, obviously, that much sulphur is absorbed from the gas, the quantity increasing with the time.

In order to test the matter still more severely, two more experiments were made by Nakamura's method, with a still more extended surface A hemispherical porcelain vessel was employed, having a diameter of three inches and a depth of one and a-quarter inches. The mixture was spread as thinly as possible:

| Percentage of Sulphur by Nakamura's Method over Gas in Porcelain Dish. | Time occupied in Oxidation. |
|---|---|
| 2.20 | 7 h. 00 m. |
| 4.00 | 12 h. 15 m. |

The large amount of sulphur that is absorbed when alkaline carbonates are exposed for any length of time over a gas flame may also be seen from the following experiment:

Forty grains of carbonate of sodium were put on in a porcelain evaporating dish over a small Bunsen flame, the heat being very gradually raised to dull redness. At the end of 17 hours the sulphuric acid was detrrmined in it; the sulphate of barium weighed 2 63 grains=0.36 of a grain of sulphur.

A series of experiments was then made over a Berzelius spirit lamp, in order to compare the relative accuracy of the two processes. The same sample of Pearth coal was taken that was used in the previous experiments:

| Deflagrations over Berzelius Spirit Lamp. | Deviation. | Time occupied. |
|---|---|---|
| 1.52 | +0.01 | 25 minutes. |
| 1.50 | —0.01 | " |
| 1.52 | +0.01 | " |
| Mean 1.51 | | |

From the above numbers it will be seen that the deflagration process, when properly conducted, yields results which leave nothing to be desired in point of uniformity.

Experiments were then made by Nakamura's method. The time employed in the operation was carefully varied, in order to ascertain if this became a factor in the results, but our experiments clearly show that if sufficient care be taken to heat gently at first, as good a result may be obtained in one as in nine hours.

It having been noticed that the sulphate of barium obtained had frequently a faint pink tinge due to the presence of traces of ferric oxide, it was thought desirable to try the effect of removing the iron before precipitating the sulphuric acid. It was found, however, that its removal did not perceptibly reduce the weight of the sulphate of barium.

| Nakamura's Process over Berzelius Spirit Lamp. | Deviation. | Time occupied. |
|---|---|---|
| 1.50 | — | 1h. 00 m. |
| 1.48 | —0.02 | 1h. 30 m. |
| 1.55 | +0.05 | 1h. 45 m. |
| 1.50 | — | 2h. 00 m. |
| 1.47 | —0.03 | 2h. 00 m. |
| 1.54 | +0.04 | 4h. 00 m. |
| 1.44 | —0.06 | 7h. 00 m. |
| 1.57 | +0.07 | 7h. 30 m. |
| 1.40 | —0.10 | 8h. 00 m. |
| 1.51 | +0.01 | 9h. 00 m. |
| Mean 1.50 | | |

| | | |
|---|---|---|
| Sulphur by deflagrations | mean | 1.51 |
| Sulphur by Nakamura's method | " | 1.50 |
| Difference | | 0.01 |

From the above numbers it is clear that if sufficient care be taken, equally correct results may be obtained by both methods, and they thus serve as a valuable check upon each other. In fact, as so often happens where the relative accuracy of processes is under consideration, the matter resolves itself into one of manipulation.

We have said that by Nakamura's method as accurate results can be obtained by oxidation for one hour as nine, and, there being no fused mass to dissolve out of the crucible, there appears to be a slight, but decided advantage on the side of his process. It must, however, be admitted that the preliminary heating requires to be done with precaution, and some experience is necessary in regulating the temperature. The slightest smoke from the coal spoils the experiment; and, as the author of the process has shown only a faint aromatic odor should be perceptible.

*Laboratory, London Gaslight Company,*
*Nine Elms, London, Feb.* 24, 1882.

---

*Sir*—We quite forgot, in our paper published in your last issue, to state that Mr. Nakamura expressly directs an Argand spirit lamp to be used in his process for the determination of sulphur in coal. The first words of our paper state that "all chemists are aware that the use of gas lamps introduces an error;" so we need hardly say that we are fully conscious that such skillful chemists as Messrs. Nakamura and Lewis Thompson Wright are quite as alive to all sources of error as ourselves.

GREVILLE WILLIAMS,
HAMILTON DOVE.

*Nine Elms, March* 9, 1882.

---

## Gas Industry.--Notes and Observations.

By GEO. SHEPARD PAGE.

One of the most practical plans for increasing day gas consumption has been introduced in Rockford, Ill., by the president and proprietor of the gas works, Thomas Butterworth, Esq. Meeting him during a recent western trip, we were discussing the advantages of a uniform day and night demand. He stated that he doubtless had in use a larger number of gas stoves in proportion to his output of gas than any other company in the United States. It was due to his system of introduction. He advertised the gift of a $16 gas cooking stove to every consumer who would pay in advance $50 for 25,000 feet of gas, the price per thousand being 20 per cent. less than his rate for consumers using no gas stoves.

Mr. Butterworth is the highly esteemed and eminently practical president of the Western Gas Light Association. Referring to their annual meeting, he stated that a paper was to be read upon the topic "The Electric Light the Best Friend of the Gas Industry." At first thought one is led to smile at this, especially when recalling the printed and verbal utterances of Edison, Brush, Swan, and other greater or lesser electric lights. But upon reflection there is brought into view the unprecedented development of activity in an industry heretofore proverbially conservative. Gas engines, gas cooking and heating stoves, Bray, Sugg, Siemens, and Douglass burners; regenerative and recuperative furnaces; crushed coke competing successfully with anthracite coal; increasing interest in the means of realizing English values for tar and ammoniacal liquor; advertising and canvassing for new business. In Washington, D. C., well executed advertising signs on the main streets and cards in the horse cars and daily papers call attention to coke, a fuel which for many purposes is equal to anthracite, better than bituminous, and cheaper than either.

This enterprise is naturally illustrated by the increase of business in 1881, varying from 10 to 45 per cent.—the latter remarkable rate having been reached in a western city of over 50,000 inhabitants.

### RESIDUALS.

Another most encouraging feature in the present condition of gas companies is the advance in the value of tar and ammoniacal liquor. Notwithstanding that in some of the principal cities combinations between the tar distillers and sulphate of ammonia makers divide up the gas companies, as competition between gas companies has already resulted in dividing up the cities, yet a better demand and higher prices prevail. Thirty cents per ton of coal carbonized is now being offered in New York city and vicinity for tar, and 22 to 27 cents for ammoniacal liquor of 10-ounce strength, where gas companies have appliances which remove all the free ammonia by water, leaving none to be wasted in the lime.

And yet these figures seem inadequate when compared with the prices obtained by all English and Continental companies. The London *Journal of Gas Lighting* of Feb. 28 contains the report of the Birmingham Gas Committee for 1881. It received the enormous sum of $193,200 for tar, and $227,760 for ammoniacal liquor—a total of $420,000, viz., 61 cents per ton for tar and 73 cents per ton for ammoniacal liquor, on a gross carbonization of 312,000 tons.

Place this in contrast with the receipts of the New York city and Brooklyn gas companies carbonizing about 350,000 tons in 1881: Tar, $52,300; ammoniacal liquor, $34,300; total, $86,500; and the necessity for continued action on the part of the gas companies to obtain better results is at once obvious.

The sum received by the Birmingham company amounted to one-fourth the income for gas and four-fifths of the net profit on the year's business.

### COAL TAR PRODUCTS.

The activity in building has caused an advance in the price of coal tar *pitch* of 40 per cent. It is now selling in large lots at 7 cents per gallon,

and the stock on hand has never been so low at this season. This advance means $90,000 additional annual income to the coal tar distillers in New York and vicinity for a product which is but 60 per cent. of the coal tar.

Nearly all the creosote (heavy) oil produced is now required for wood preservation by the creosoting works in Boston, Brooklyn, Elizabethport, Pascagoula, Houston, and St. Louis, the annual consumption aggregating over 2,000,000 gallons. At New York creosote oil has been advanced this spring to 8 cents per gallon. Three years ago it was selling at 4 cents per gallon. As the production of New York and vicinity is upward of 1,500,000 gallons, 1882 will add $60,000 to the income of coal tar distillers over that of 1879.

CHINOLINE.

The newest development in the chemistry of coal tar is chinoline, and from present indications it promises to be a factor in still further increasing the value to gas companies of this residual. Chinoline (quinoline), one of the derivatives of quinine, has been artificially produced by Zdenko H. Skraup, of Vienna, and has already been adopted by physicians for use as a febrifuge in place of quinine—the tartrate of chinoline being the form prescribed. Chinoline is an oily, mobile liquid, not suited for medical use; hence the tartrate, in silken, shining, non-deliquescent crystals, having a slight odor of bitter almonds, tasting somewhat like peppermint, is used. Chinoline is made from carbolic acid (phenol). Dr. Loewy, a German physician, treated 40 cases of intermittent fever with tartrate of chinoline with such good results he states that it should be ranked with quinine. It can be furnished at a much lower price (about 75 cents per ounce). Dr. H. Endemann, late chemist of the New York Board of Health, has just been granted a patent for an improved process for producing tartrate of chinoline, a fine specimen of which, together with chinoline, he has kindly given me, and a sample of which I send you.

## Price of Gas at Youngstown, Ohio.

Since January 1st, 1882, gas has been sold as follows in Youngstown, a city of 20,000 inhabitants:

| | | | |
|---|---|---|---|
| For monthly consumption of | 5,000 cubic feet | ...$1.90 | per M. |
| " " | of 15,000 " | ...$1.70 | " |
| " " | of 25,000 " | ...$1.60 | " |
| " | of over " | ...$1.50 | " |

It is needless to say that consumption increases with these prices, and that people are satisfied.

## Prospects of another Gas War.

There is a prospect, it is said, of another gas war in Brooklyn, the terms of agreement between the old gas companies and the Fulton Municipal gas company having nearly run out. The latter company was started in opposition to the old corporations, when they were charging so much for gas that the consumers were resorting to kerosene. They laid their pipes through the same streets as the old companies and had begun an actual rivalry when the old corporations agreed, it is said, to pay them the handsome sum of $112,000 per year and take their gas. The result was that the citizens failed to realize any benefit from the starting of the new company. Now, it is said, the Standard Oil Company is going to take charge of the Fulton Municipal Company, to lay mains through all the streets and run in opposition to the old companies until it runs them out and has the field clear.—*Journal of Commerce.*

## Proceedings of Physical Society.

Saturday, February 25th, 1882, Professor G. C. Foster in the Chair.

Professor W. E. Ayrton, F.R.S., read a paper on "Faure's Accumulator," giving the results of experiments made by him and Professor Perry on the efficiency, storing power and durability of the battery. The efficiency was got by measuring the power put in and comparing it with that taken out, by means of Perry and Ayrton's voltameter and ammeter. The authors found that the cell has great resuscitating power if left insulated after all the current appears to have been discharged. Care had to be taken to see that the cell was quite discharged by letting it stand on open circuit for intervals and discharging between whiles. When this was done they found that the total loss for charges up to one million foot-pounds need not be greater than 18 per cent. With slower charges they got a loss of only ten per cent. As to the storage, a mean current of 10 Amperes gave after 18 hours' discharge (six hours on three consecutive days) 1,440,000 foot-pounds of work, equivalent to one horse-power in forty-three minutes. This cell contained 81 pounds of red lead, thus making a capacity of about 18,000 foot-pounds per pound of red lead. The cell showed no deterioration after two months of work.

Professor Ayrton then described a new form of his dispersion photometer, which greatly reduces it in size and convenience. The principle of this instrument has already been described to the society by the authors. It consists in using a concave lens to disperse the stronger light, and thus obviate the necessity of putting it at a great distance if it is very powerful, such as an electric light. The powers of the two lights are compared by the eye in estimating the intensity of the shadows of a rod thrown on a white screen of blotting paper by the two lights simultaneously. A sperm candle is used as the standard, and it is placed on a movable stand at an angle to the path of the other beam through the lens. Both the lens and candle can be shifted to and from the screen along a scale giving their distances, and the stronger beam is reflected from a small mirror. This mirror is ingeniously fixed so as to reflect the ray from the same part of its surface whatever angle it is placed at, and thus the power of an electric light can be accurately given for every angle along which the ray travels from the lamp. Observations are taken through red and green glasses to get a better measure of the power of the light. Professor Ayrton has found that ordinary air absorbs the green rays of the electric light very strongly, and hence, in order to get a proper test of an electric lamp, the photometer should not be far from the light. The new dispersion photometer shown is the only one admitting this precaution.—*Chem. News.*

## The Coal Tar Nuisance.

Recent visits to a dozen small works show that the mismanagement of their tar causes more perspiration and profanity than is either necessary or pleasant to ears polite.

Scrubbers are misplaced; that utterest of abominations, the goose-neck overflow, is largely used; the tar is not taken, as it should be, from the bottom of the hydraulic main; steam-jet exhausters are passing gas loaded with tar; lime, oxide and *iron sponge* find this tar standing like a wall between them and their proper work—and so things are altogether in a nice predicament.

Now I'll cut this knot by offering to the tar-afflicted companies to supply a machine *with the guaranty that not one drop of tar shall ever get past it*, except during a period of say six hours, once in two or three years, at which intervals the machine will require cleaning.

An evidence of the perfect work of this *Pelouze & Audouin Condenser is* afforded by the fact that the San Francisco scrubbers, at the Potrero station, are preceded by a 20-inch P. & A. condenser, have run for eight years without change of their coke filling; and give now precisely the same back-pressure as when set to work.

Any further information can be obtained on application to

JAS. R. SMEDBERG,
111 Broadway, (Room 89) N. Y. City.

—*Adv.*

# Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

**Reply to Engineer.**

49 WALL STREET, NEW YORK, March 11, 1882.

To the Editor AMERICAN GAS LIGHT JOURNAL:

It is possibly anticipated by some of my friends on both sides the Water, identified with the important industry which your columns so ably advocate, that some notice would be taken of the rather personal onslaught made by your English correspondent, "Engineer," in the issue of Feb. 16th, and I trust that I am not uncharitable in terming the somewhat ungrammatical, and seemingly excitable, effusion "personal."

I am deeply grateful that he devoted but three paragraphs to the subject of my address before the American Gas Light Association, at Boston, in October last, while nine are occupied in assailing the still more unfortunate electrician, Dr. Leo Daft, of this city—hence, while the statements of the latter gentleman are termed "clap trap," "stupid nonsense," "a huge, inflated bubble, to be sat upon and burst," "misrepresentation," "misstatements," "bolstered up," "usual misleading statements," and the charge is argumentatively made that "he has some ulterior motive in view," I am only indebted to him for the gentle intimation that certain remarks were "bombast" and "nonsense"; that not even "a buffalo hide steel-plated bushel could hide our light," (by-the-way, how would a gas "engineer" attach a steel plate to a buffalo hide) and, heaviest charge of all, denounces an address, based upon a plan not only for treating residuals but for selling them, as "carpet-bagging, commercial drummer style—not good engineering."

I am somewhat familiar with the works of Clegg, Bowditch, Hughes and King. Surely, the language they use, even when sharply critical, is quite in contrast to that of "Engineer," both in manner and matter. However, they

may not be of equal authority upon "good engineering," and, if your correspondent's style is accepted as the standard, certainly not upon good manners.

I fully appreciate the misfortune, so delicately alluded to by the writer of "An English Engineer's Criticism of Certain Statements by Electricians," that I have not the honor to be numbered among his acquaintances. My grief is all the more poignant when I reflect that his identity is hidden under a *nom de plume* which may cover the form and fame of one of England's most notable engineers.

Although I count, with pride, among my personal friends the engineers of many English, French, Belgian, German and Russian gas companies (notwithstanding I am not an engineer), what are they all in comparison with your correspondent "who does not remember the name of Page"?

Although "Engineer" evidently wishes to be accounted a very bright man, yet he has grievously misconstrued the plain meaning of the paragraph quoted by him, as follows, "inventive talent here is riper and more active than on the other side." He falsely assumes this to apply to the coal tar color manufacture in America; whereas it was entirely general and referred to a thousand inventions of great value—as the sewing machine, telegraph, telephone, submarine cable, mowers and reapers, revolvers, submarine torpedoes and torpedo boats, the monitor, cotton gin, vulcanized india-rubber, etc.

Indeed, further illustrated by notable inventions in gas apparatus. I remember visiting the Dublin gas company's works in 1870, and witnessing the operation of a "perfected steam drawing and charging machine," which was to be substituted everywhere for manual labor. It was, I think, later introduced in a works in London. It proved an utter failure. But a western mechanic, A. Q. Ross, of Cincinnati, Ohio, U.S.A., has invented the first practical steam stoker, and it is now in successful operation at Cincinnati, New Orleans, by the Manhattan gas company in New York, and has been practically operated at the London gas company, London, and in Marseilles, France. The celebrated English firm of gas machinery builders, Messrs. Tangye Bros., have secured the agency for Great Britain.

In conclusion, I must express my deep sense of obligation to your correspondent for his prefatory endorsement of my address as "all very good, and an excellent *resume* of the coal tar color trade," notwithstanding his speedy and slightly inconsistent announcement that "its goodness is quite spoiled, etc., etc.," and the further implication that my statements as to the early establishment of the aniline color business in this country were questionable.

As a matter of fact this business has already obtained a foothold here, notwithstanding the desperate efforts of foreign manufacturers to stamp it out.

GEO. SHEPARD PAGE.

---

### Electric Light at Akron, Ohio.

EXCHANGE HOTEL,
COLUMBUS, OHIO, March, 22, 1882.

To the Editor AMERICAN GAS LIGHT JOURNAL:

A few days ago I sent you a copy of the Akron (Ohio) Daily *News*, containing expressions of opinion by citizens of Akron adverse to the Brush tower lights in use in that place. Thinking a personal observation of the light might interest your readers I concluded to write to you. I went to Akron not so much for the purpose of finding what was the cost of operating the nine lamps (that has been publicly demonstrated, I believe, to largely exceed the cost of the gas previously used) but to see how the tower system *lighted* the town. The sum of my observations is that the town cannot be said, as a whole, to be lighted at all. No gas is used for street lamps, and the oil lamps are burned only in parts of the town. The towers only give a light of practical value within a range of less than three short squares in the streets on which the lights are situated. The cross streets running into those on which the lights are situated are "as dark as Egypt," the electric light only illuminating the tops of the houses on one side of these streets. While the Brush lamps are brilliant at the burning point (painfully so to the eyes) the distance to which they will cast a good light seems surprisingly small, even when we remember that the ranges, in a direct line, of different lights are not directly proportional to their intensities, but only as the square roots of their respective candle powers.

To show how short the range of the tower lights is—at the intersection of Howard and Market streets is a wrought iron tower 208 feet high, on top of which are four lamps, said to be of 4000 candle power each; now, for a test of what this light can do. Desiring to cross the street three short squares from the tower on the same street (Howard) I could not see far enough in front of me to find whether there was a stone crossing there or not (my eyes are good ones, 31 years old) and on the *fourth* square from the tower, and in a direct line with it, the oil lamps were burning—they *ought* to have been burning on the *third* square.

At the engine house there was one 4000 candle Brush lamp which threw a good light on the spot where I was standing with a friend on the sidewalk opposite the engine house. The shadow of the building extended over the sidewalk, across the way, and into the street a few feet. Now, although the street is rather narrow, on looking across it the shadow of the engine house was so black that we could not see the figure of a man, nor any other object, in the shadow.

Even a short distance from the big tower light the shadows were extremely black. The light does not seem to diffuse at all, After the shop lights are out a footpad could lurk unobserved in any doorway, or behind any projection, and strike you down before you saw him. The shadows are so deep that even within a short distance of the tower you cannot see the faces of persons coming towards you from the town.

A prominent manufacturer of Akron, whose name and character are widely and favorably known, in conversation with me pronounced this system for street lighting a "humbug"; and, although he uses one of their machines in his factory, operating it with the same engine that he uses to run his machinery, says he only put it in because he was too far away from the gas mains to get gas, which he would greatly prefer, at a moderate price.

An old citizen of high standing laughingly remarked to the writer that the Brush people were "lightning" for smartness, and that it was always when the moon was about a week old, and its light sufficient to help out the electric light that they brought village councilmen and other inspectors to Akron.

As the expressions of all the citizens to whom I talked were adverse to the present system of lighting the town, I cannot think it will be very long until the sovereign voter will make himself heard, and Akron will abolish the present ghastly glare and return to her "old love," the soft, beautiful, diffusive, always reliable gas light. Yours truly,

HARRY CALDWELL,

---

### Relation of Holder Capacity to Maximum Make.

To the Editor AMERICAN GAS LIGHT JOURNAL:

I wish an opinion through the columns of the JOURNAL of a matter that has lately come under my observation, and in stating the case will be as brief as is consistent with a full and clear statement of the facts.

Capacity of works, 200,000 maximum per day; capacity of holder, 85,000; number of street lamps largely in excess of the usual number supplied by works of this size. When the make or output is at its maximum, the manager necessarily has a greater number of benches under fire than would be needed if the proper storage capacity was supplied, and "suspended" benches are in order, especially during "light of moon."

For several years, notwithstanding adverse circumstances, the gas furnished has given general satisfaction, except at intervals during the long dark nights of November and December. During part of this time two of the purifying boxes slightly leaked over from the center valve, the other two being perfectly tight. After this lapse of years the gas suddenly became fearfully laden with sulphur, notably far worse during the light of the moon, when many retorts were "suspended."

Investigating for defects in the plant, a minute crack was discovered in one of the partitions of the center valve connecting with the annular—so very small that it would not admit the edge of a knife blade; and as it was presumably caused by the settling of a purifier, the tendency would be to cause the face of the seal to sag; but so very slight was the defect, that there was not the slightest outward sign of leak between faces of hood and seal. This trifling crack was shouldered with all blame for the sulphurous fumes, and a new seal was ordered; but, as if to disprove this very theory of the trifling amount of gas that leaked through vitiating the large amount of gas made, the gas actually improved at the very time they most loudly advocated it; and, while waiting for new seal, the gas became almost free from sulphur, except at the time retorts were "suspended," and the improvement continued as the days lengthened, and the output diminished, and irrespective of whether the leaky boxes were in or out of action.

Now we hold that while the slight crack allowed a very small portion of gas to pass through, or over, the partition, it was too little to cause the gas, at *stated intervals*, to be almost unbearable, and that the fault must be placed elsewhere, and is largely attributable to lack of holder capacity and all its attendant evils. Are we right, or are we wrong. F.

[In reply to above we would say that the ratio of holder capacity to maximum make is altogether *too small*, and no works can be run to the best advantage, especially with an intermittent make such as would be caused by the "moon-lighting" system of street lighting under such conditions.

If a leak existed in the purifiers sufficient to vitiate the whole make of gas it would naturally be more apparent on a small make than on a large one, but would not be intermittent. There seems to be a mystery about the case as stated but subsequent investigation may solve that.

The policy of crowding and squeezing any portion of the plant cannot be too strongly condemned, and any board of directors who force their manager to carry on their works with a holder room equal to only 42½ per cent. of the maximum make are not doing the best possible for the stockholders interests, to say nothing of the proper service of their customers.—ED.]

THE AMERICAN
GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

Editor—G. WARREN DRESSER.
Manager—C. E. SANDERSON.

PUBLISHED ON THE 2ND AND 16TH OF EACH MONTH
At No. 42 Pine Street, New York.

This is a recognized official organ of—
LIGHT, HEAT, STEAM, WATER-SUPPLY,
VENTILATION, SANITARY IMPROVEMENT,
AND GENERAL SCIENCE.

TERMS

SUBSCRIPTION—Three Dollars per annum, in advance.

AGENTS

NEW YORK—AMERICAN NEWS CO., 39 and 41 Chambers St.
BOSTON—S. M. PETTENGILL & Co., 6 State Street.
PHILADELPHIA—PRATT & Co., Corner 9th and Arch Streets.
*England*—C. W. HASTINGS, 22 Buckingham St., London, W. C.
*Germany*—B. WESTERMANN & Co., of New York

MONDAY, APRIL 3, 1882.

## Bids for Lighting Public Lamps in the City of New York.

| Company. | Gas. | Lamp-Post straightened. | Column releaded. | Column refitted. | Lamp removed. | Lamp reset. | New Lamp fitted up |
|---|---|---|---|---|---|---|---|
| Manhattan ..... | 17 50 | 1 50 | 1 50 | 3 50 | 3 50 | 10 | 10 |
| New York ..... | 17 50 | 1 50 | 1 50 | 3 50 | 3 50 | 10 | 10 |
| Mutual* ..... ... | 17 50 | 1 50 | 1 50 | 3 50 | 3 50 | 10 | 10 |
| Metropolitan* . | 17 50 | 2 | 2 | 3 | 3 | 8 | 8 |
| Harlem..... | 19 50 | 2 50 | 2 50 | 3 50 | 3 50 | 8 | 8 |
| Yonkers..... . | 39 00 | 1 | 1 | 1 00 | 1 50 | 8 | 10 |
| Central..... ... | 29 00 | 1 50 | 1 50 | 1 50 | 3 50 | 8 | 8 |
| Northern..... | 32 00 | 1 50 | 3 50 | 3 00 | 3 00 | 8 | 8 |
| Automatic Gas Lamp & Lighting Co.†..... | 27 00 | 1 50 | 1 50 | 3 50 | 3 50 | 10 | 8 |

* Schedule.
† Naphtha. Any portion of central part of city.

Brush Electric Illuminating Company, 70 cents per lamp per night.

Same Company, for High Bridge, from 16 to 32 lights, at $1 per lamp per night if city boilers supply steam, or $1.50 per lamp per night if Brush Company furnish their own steam.

United States Illuminating Company, 70 cents per lamp per night.

## Effect of Colored Glass on Liquids.

A German scientific journal recently published an article on the effect of the color of glass bottles on the liquor contained therein, in which the following interesting statements were made:

Liquors contained in colorless bottles, when exposed for some time to the light, acquire a disagreeable taste, notwithstanding the fact that they may have been of superior quality before being so treated; liquors contained in brown or green bottles, however, remain unchanged in quality, even if exposed to direct sunlight. This phenomenon has not received proper attention heretofore, and quality has often been sacrificed for the sake of outward appearance. Since the results of the above treatment are due to the chemical action of light, it is advisable to use red, orange, yellow, green, or opaque bottles for the preservation of liquors, while colorless, blue, and violet ones should be entirely discarded.

## Equitable Gas Light Company, of New York City.

ALBANY, Mar. 10.—The following corporation filed certificate with the Secretary of State to-day: The Equitable Gas Light Company, of New York; capital, $2,000,000. The company is to continue fifty years. The incorporators are William Rockefeller, John D. Archbold, James R. Keene, E. Stern, Erasm. J. Jerzmanowski, E. J. Dickerson, and Benjamin Brewster.—New York *Tribune*, Mar. 11.

## Gas Stocks.

**Quotations by G. W. Close Jr., Broker and Dealer in Gas Stocks.**
**(with W B Scott & Co.,)**
34 PINE STREET, NEW YORK CITY.

APRIL 3, 1882.

☞ All communciations will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

| | Capital. | Par. | Bid. | Asked |
|---|---|---|---|---|
| *Gas Co.'s of N. Y. City.* | | | | |
| Central..... | $466,000 | 50 | 70 | 75 |
| Harlem..... | 1,800,000 | 50 | 94 | 96 |
| " Bonds | 170,000 | | | 103 |
| Manhattan..... | 4,000,000 | 50 | 232 | 235 |
| Metropolitan..... | 2,500,000 | 100 | 163 | 166 |
| " Bonds... | 658,000 | ... | 107 | 110 |
| Mutual..... | 5,000,000 | 100 | 97 | 99 |
| " Bonds, go'd. | 900,000 | 1000 | 202 | 205x |
| Municipal..... | 1,500,000 | 100 | 198 | 202 |
| " Bonds ..... | 750,000 | | 106 | 110 |
| New York..... | 4,000,000 | 100 | 124 | 125 |
| Northern..... | 270,000 | 50 | — | 100 |
| *Gas Co's of Brooklyn.* | | | | |
| Brooklyn ..... | 2,000,000 | 25 | 110 | 114 |
| Citizens..... | 1,200,000 | 20 | 60 | 65 |
| " S. F. Bonds. | 320,000 | 1000 | 105 | 109 |
| Fulton Municipal..... | 1,500,000 | 100 | 85 | 90 |
| Peoples..... | 1,000,000 | 10 | 25 | 30 |
| " Bonds..... | 290,000 | . | 101 | 104 |
| " " ..... | 250,000 | ... | 70 | 75 |
| Metropolitan..... | 1,000,000 | 100 | 60 | 65 |
| Nassau..... | 1,000,000 | 25 | 60 | 64 |
| " Ctfs..... | 700,000 | 1000 | 95 | 100 |
| Williamsburgh ..... | 1,000,000 | 50 | 60 | 65 |
| " Bonds | 1,000,000 | ... | 98 | 103 |
| Richmond Co., S. I. | 300,000 | 50 | 70 | 75 |
| " Bonds..... | 40,000 | — | — | — |
| *Out of Town Gas Companies.* | | | | |
| Buffalo Mutual, N.Y | 750,000 | 100 | 75 | 80 |
| " Bonds | 200,000 | 1000 | 95 | 100 |
| Citizens, Newark..... | 918,000 | 50 | 80 | 85 |
| " " Bds. | 124,000 | — | 105 | 10 |
| Chicago Gas Co., Ills | | | 125 | — |
| Cincinnati G. & C. Co. | | | 178 | 180 |
| Consolidated, Balt. | | | 38 | 39 |
| Bonds.... | | | 107 | — |
| East Boston, Mass... | 220,000 | 25 | 122 | 128 |
| Hannibal, Mo..... | 100,000 | 100 | 95 | 100 |
| Hartford, Conn..... | 700,000 | 25 | 140 | 144 |
| Halifax N. S..... | 400,000 | 40 | 148 | 150 |
| Hamilton, Ontario... | 150.000 | 40 | 117½ | |
| Jersey City ..... ... | 750,000 | 20 | 155 | 160 |
| Jacksonville, Ill..... | 120,000 | 50 | 100 | ... |
| Lewistown Maine... | 400,000 | 100 | — | 100 |
| Laclede St Louis Mo. | 1,200,000 | 100 | 108 | 110 |
| Montreal, Canada.... | 2,000,000 | 100 | 173 | 174 |
| New Haven, Conn... | | 25 | 132 | — |
| Oakland, Cal..... | | | 32 | 33 |
| Peoples, Jersey City | | ... | 75 | 80 |
| " " Bds. | | | | 5 |
| Pittsfield, Mass..... | | | 120 | 130 |
| Rochester, N. Y..... | | 50 | 70 | 80 |
| " Citizens | | 100 | 30 | 35 |
| Wilmington, Del.... | | 50 | 174 | ... |
| Yonkers..... | | 50 | 30 | 32 |
| St. Louis Missouri.. | 600,000 | 50 | 250 | 254 |
| San Francisco Gas-Co., S. Fr'isco Cal. | | | 68 | 69 |
| Toledo, Ohio..... . . | | | 95 | 97 |
| Troy, Citizens.. ..... | 600,000 | 100 | — | — |
| Washington, D. C... | 1,500,000 | 20 | 185 | 200 |
| " Scrip | 375.000 | 15 | 200 | 206 |

## Advertisers Index.


**GAS ENGINEERS.** Page

William Farmer, New York City..... 166
G. Warren Dresser New York City..... 164

**GAS WORKS APPARATUS AND CONSTRUCTION.**

Herring & Floyd, New York City ..... 163
T. F. Rowland, Greenpoint, L. I..... 163
Delly & Fowler, Phila., Pa..... 163
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 163
Stacey Mfg. Co., Cincinnati, Ohio..... 163
Bartlett, Hayward & Co., Baltimore, Md..... 163
P. Munzinger, Phila., Pa..... 163
Morris, Tasker & Co., Limited, Phila., Pa..... 163

**GAS AND WATER PIPES.**

A. H. McNeal, Burlington, N. J..... 162
Gloucester Iron Works, Phila., Pa..... 162
R. A. Brick, New York City..... 162
James Marshall & Co., Pittsburgh, Pa..... 162
R. D. Wood & Co., Phila., Pa..... 162
Warren Foundry and Machine Co., Phillipsburgh, N. J..... 162
Mellert Foundry and Machine Co., Reading, Pa..... 162

**WASHERS AND SCRUBBERS.**

G. Shepard Page, New York City..... 158

**RETORTS AND FIRE BRICK.**

J. H. Gautier & Co., Jersey City, N. J..... 160
B. Kreischer & Sons, New York City..... 160
Adam Weber, New York City..... 160
Laclede Fire Brick Works, St. Louis, Mo..... 160
Brooklyn Retort and Fire Brick Works, Brooklyn, N. Y..... 160
Borgner & O'Brien, Phila., Pa..... 160
Gardner Brothers, Pittsburgh, Pa..... 160
Henry Maurer, New York City..... 160
Evens & Howard, St. Louis, Mo..... 160
Chicago Retort and Fire Brick Works, Chicago, Ills..... 160
Taylor and Anderson, Cincinnati, Ohio..... 158

**DIETERICH'S REGENERATOR FURNACE.**

Charles F. Dieterich, Baltimore, Md..... 142

**GAS METERS.**

Harris, Griffin & Co., Phila., Pa..... 166
American Meter Co., New York and Philadelphia..... 167
The Goodwin Gas Stove and Meter Co., Phila. Pa..... 167
Helme & McIlhenny, Phila., Pa..... 167

**GAS STOVES.**

American Meter Co., New York and Philadelphia..... 159

**VALVES.**

Ludlow Valve Manufacturing Co., Troy, N. Y..... 164
Chapman Valve Manufacturing Company, Boston, Mass..... 164

**EXHAUSTERS.**

P H. & F. M. Roots, Connersville, Ind..... 161
Smith & Sayre Manufacturing Co., New York City..... 161

**GAS COALS.**

Penn Gas Coal Co., Phila., Pa..... 165
Perkins & Co., New York City..... 164
Cannelton Coal Co., New York and Philadelphia..... 165
New York and Cleveland Gas Coal Co., Pittsburgh, Pa..... 165
Newburgh Orrel Coal Co., Baltimore, Md..... 165
Despard Coal Co., Baltimore, Md..... 165
Fort Pitt Gas Coal, Pittsburgh, Pa..... 164
Chesapeake and Ohio R.R Coal Agency, N. Y. City..... 165

**GAS ENGINES.**

Schleicher, Schumm & Co., Phila., Pa..... 134

**STEAM STOKERS.**

A. Q. Ross, Cincinnati, Ohio..... 144

**PURIFIER SCREENS.**

George D. Cabot, Lawrence, Mass..... 133

**BURNERS.**

G. Gefrorer, Phila., Pa..... 164
The Goodwin Gas Stove and Meter Co., Philadelphia, Pa..... 168

**PURIFYING MATERIAL.**

Connelly & Co., New York City ..... 191

**STEAM BLOWER FOR BURNING BREESE.**

H. E. Parson, New York City..... 184

**PROCESSES.**

Gwynne Harris New York City..... 164
Strong Gas and Fuel Co., Yonkers, N. Y..... 158
National Gas Company, Phila., Pa ..... 158

**GAS FIXTURES.**

Mitchell, Vance & Co., New York City..... 161

**CEMENT.**

F. O. Norton, New York City..... 161

**BOOKS.**

Economy of Gas as a Fuel..... 165
Gas Analyst's Manual..... 161
Scientific Books..... 162
Cathels' Gas Consumers' Manual..... 167
Fodell's Book-Keeping..... 167
Review of Gas and Water Engineering ..... 167



## WANTED, AN ASSISTANT.

A thorough, sober, and reliable man is wanted to do

**GAS FITTING AND GENERAL REPAIRS**

at works; to set and take indexes of meters, etc. To a worthy man good prospects of promotion will be offered. None need apply except such as can command complete confidence, both as t workmanship and sobriety. The works are situated west of the Mississippi river. Address "C. G. L.," this Office.

## ENGAGEMENT DESIRED,

**By a Young Man of Ten Years' Experience in the Management of Small Works.**

Has had practical experience in all branches of the business. Can be well recommended for industry, economy, and attention to duty. Address "A. B.," this Office.

## 350 Miner Globe Lanterns FOR SALE CHEAP.

Are in good order, and will be sold in lots to suit. Apply to the NEW YORK & NEW JERSEY GLOBE GAS LT. CO., Limited,
547-1t 152 Broadway, N. Y. City.

## Announcement.

BY ARRANGEMENT WITH

**JOHN METHVEN,**

of the London Gas Lt. Co., inventor of the

**NEW STANDARD PHOTOMETER,**

THE SOLE AGENCY FOR THE UNITED STATES IS VESTED IN THE UNDERSIGNED.

**GEO. SHEPARD PAGE,**

**49 Wall Street, New York.**

CHAS. TAYLOR, Manufacturer. J. ANDERSON, Manager.

## CINCINNATI Gas Retort & Fire Brick Co.

**TAYLOR & ANDERSON,**

(Late CHAS. TAYLOR, estab. 1872.)

CONTRACTORS, AND MANUFACTURERS OF

**GAS RETORTS, FIRE BRICK, AND TILE.**

BLAST FURNACE LININGS; CUPOLA BLOCKS;
GRATE SETTINGS; STOVE LININGS;
FELL'S, DANK'S AND FRANK'S SMOKE PREVENTOR TILES;
DANK'S ROTARY PUDDLING FURNACE TILES;
SIEMENS' & OTHER GAS REGENERATIVE FURNACE TILES;
XXX PRESSED GAS-WORKS FURNACE BLOCKS;
FIRE CEMENT, ETC., ETC.

**POROUS NON-CONDUCTING BRICKS FOR BENCH FRONTS.**

Plans furnished, and competent men supplied to put up work.

BRANCH WORKS, NEW CUMBERLAND, W. VA.

**General Office and Works,**

**BURNS ST., CINCINNATI, O.**

## The "Standard" Washer-Scrubber

**KIRKHAM, HULETT & CHANDLER PATENT.**

Removes **all the Ammonia** and a large percentage of **Sulph. Hydrogen and Carb. Acid.**

GAS WORKS, PLACE D'ORLEANS, QUEBEC, March 10, 1882.

GEO. SHEPARD PAGE, ESQ., New York:—I inclose you copies of the Government Inspector's test and certificate, showing that the washer is working well and taking out every particle of ammonia.

D. H. GEGGIE, Secretary and Manager.

"GAS INSPECTOR'S OFFICE, QUEBEC, March 7, 1882.

"I hereby certify that at the request of the Quebec Gas Company I have tested the purity of the gas furnished by the said Company, and after testing such gas in accordance with the provisions of the act to provide for the inspection of gas, I find the quantity of ammonia contained therein is 0.00 in 100 cubic feet thereof.

N. LEVASSEUR, Inspector."

NEWPORT GAS LIGHT CO., NEWPORT, R. I., March 12, 1882.

GEO. SHEPARD PAGE, ESQ.:—I have many letters inquiring about my experience with the "Standard" Washer-Scrubber, and I give only the plain facts of its behavior with us, which is in every respect so creditable to the machine that I can always give it a first-class character to those seeking its help.

WILLIAM A. STEDMAN.

**The following American Gas Companies have adopted the "Standard" Washer-Scrubber:**

| | | | |
|---|---|---|---|
| Allegheny, Penn. | Consolidated, Baltimore. | Citizens, Newark, N. J. | Williamsburgh, N. Y. |
| Metropolitan, N. Y. | Newport, R. I. | Havana, Cuba. | Quebec, Canada. |
| Richmond, Ind. | Rockford, Ill. | St. Joseph, Mo. | |

The concentrated ammoniacal liquor produced has an immediate sale at prices much above what has heretofore been offered.

**GEO. SHEPARD PAGE, 49 WALL STREET, N. Y.,**
SOLE AGENT FOR THE WESTERN HEMISPHERE.

## CIRCULAR TO GAS LIGHT COMPANIES.

BRANCH OFFICE OF THE STRONG GAS FUEL AND LIGHT COMPANY,
CORNER BROADWAY AND MAIN STREET, YONKERS, July 2, 1881.

The YONKERS FUEL GAS COMPANY is now in successful operation, manufacturing Water Gas by the STRONG PROCESS, for HEAT, POWER, and LIGHT.

It has about two and a half miles of mains already in use through the heart of the city of Yonkers, and is supplying gas for cooking, heating, and various industrial purposes.

The problem of a purely fuel gas is at length practically solved, and is a complete success. That it must speedily go into universal use is apparent to everyone.

Gas Light Companies are cordially invited to visit Yonkers and inspect this new system, which, if electricity *should* eventually drive them out of the field of illumination, will open to them another field still more vast and fruitful, and from which they never can be dispossessed. The Westchester Gas Light Company of the city of Yonkers employes the Lowe Process for making its gas. Here, then, can be seen, side by side in business competition, the Strong and the Lowe against the Motay and the old coal gas methods, and each observer will be enabled to form his own opinion as to their relative power and value. The STRONG GAS FUEL AND LIGHT COMPANY is the proprietor for the State of New York of the Strong Patents, five in number, and of the Lowe Patents, two in number. All applications for licenses or for information should be addressed, as above, to

**R. W. VAN PELT,** *President of the Company,*
*And also President of the Yonkers Fuel Gas Co., and of the Westchester Gas Light Co.*

## WANTED, TO PURCHASE,

## Several Gas Works Anywhere in the United States,

WITH A VIEW TO IMPROVING AND EXTENDING THE SAME.

Companies not paying dividends, or who are about to rebuild or enlarge their works, and do not wish to make assessments for improving, will find it to their interest to communicate with us before expending money for repairs or improvements.

Call or address, with some particulars, such as average consumption of gas, the selling price to consumers, holder capacity, size and length of street mains, etc.,

**THE NATIONAL GAS COMPANY,**
**Builders of Lowe's Improved Gas Works,**
**No. 430 Walnut Street, Philadelphia, Pa.**

## WANTED,

**To Lease or Purchase,**

***A GAS WORKS,***

In a Town using from 3,000,000 to 15,000,000 per annum.

Address **A. D. CRESSLER,**
Manager Kerr Murray Mfg. Co.,
546-5t FORT WAYNE, IND.

## FOR SALE,

## Four Purifying Boxes,

**5 x 10 ft., with Center Seal. In complete order.**

For further information apply to
547-tf CONSUMERS GAS CO., Newburgh, N. Y.

Awarded the Semi-Centennial Gold Medal by the Am. Inst., 1881. Awarded the First Premium at St. Louis, 1881.

# AMERICAN METER CO.,

SOLE MANUFACTURERS OF THE

# "ECONOMY" GAS STOVES

It is with renewed confidence that we offer the "Economy" Cooking Stoves to the public as being the most efficient, economical, and durable Gas Stoves in the market. Efficient from the rapidity with which they do their work, economical as to the consumption of gas, and durable from the quality of material and workmanship employed in their manufacture.

These Stoves were awarded the *Semi-Centennial Gold Medal* at the Exhibition of the American Institute, 1881, and the *First Premium* at the St. Louis Fair, 1881. AMERICAN METER COMPANY.

All sizes of our "Economy" Range, from "6A" upward,

ARE FITTED WITH THE

**NEW AND IMPROVED ROASTING OVEN DOOR**

With these Stoves all qualities of Gas can be used.

NO EXTRA CHARGE FOR NICKEL PLATED FITTINGS.

UNEQUALED ECONOMY OF GAS FOR THE QUANTITY OF COOKING DONE.

A THOROUGHLY DIFFUSED HEAT THROUGHOUT THE WHOLE STOVE.

ALL THE OVENS TIGHT, JACKETED, AND PERFECTLY VENTILATED.

PATENT SMOKELESS GAS-AND-AIR BURNERS OF SUPERIOR POWER FOR BOILING, FRYING, STEWING, PRESERVING, JELLYING, HEATING SAD-IRONS, ETC.

GENERAL AND SPECIAL SUPERIORITY IN ALL COOKING OPERATIONS.

No. 9.—"Economy" Gas Range, with Improved Roasting Oven Door.

A BROILER UNDER THE FIRE WITHOUT SMOKE.

AN OPEN ROASTER UNDER THE FIRE WITHOUT SMOKE.

UNSURPASSED EXCELLENCE OF WORKMANSHIP AND FINISH.

DOWNWARD RADIATING BURNERS OF GREAT POWER.

RADIATING BURNERS THAT CONSUME THE GAS OF ANY LOCALITY WITHOUT ODOR OR SMOKE.

BURNERS THAT ARE PRACTICALLY INDESTRUCTIBLE FROM TIME OR USAGE.

THESE STOVES ARE MADE IN ALL SIZES, TO MEET THE REQUIREMENTS OF ANY FAMILY.

SEND FOR ILLUSTRATED CATALOGUE.

**AMERICAN METER CO., New York and Philadelphia.**

**J. H. GAUTIER & CO.,**
CORNER OF
**GREENE AND ESSEX STREETS,**
***JERSEY CITY, N. J.***
MANUFACTURERS OF
**Clay Gas Retorts,**
**Gas House Tiles,**
**Fire Bricks, Etc. Etc.**
**Ground Clay, Fire Brick and Fire Sand in Barrels,**
393-1y
J. H. GAUTIER.
C. E. GREGORY
T. B. GAUTIER.

**BROOKLYN**
**Clay Retort & Fire Brick Works,**
(EDWARD D. WHITE & CO.)
Manufacturers of Clay Retorts, Fire Brick, Gas House and other Tile.
VAN DYKE, ELIZABETH, RICHARDS & PARTITION STS.
Office, 88 Van Dyke St., Brooklyn, N. Y.

**LACLEDE**
FIRE BRICKS AND
**GAS RETORT WORKS**
CHELTENHAM, MO.
Hand and Machine made Retorts and Settings, Superior Fire Bricks for Siemans Gas and Glass Furnace. Bricks and Tiles for Whitwell's Hot Blast Ovens, Blast Furnace and Cupola Tiles, Etc.
***Fire Bricks and Tiles***
of all shapes and sizes.
Glass Pot Clay. Fine Ground Clay and Fire Bricks. Sewer Pipe, Etc.
**901 Pine Street, St. Louis, Mo.**
642—

ESTABLISHED IN 1845.
**B. KREISCHER & SONS,**
OFFICE FOOT OF HOUSTON ST., E.R., N.Y.
**Gas Retorts,**
***TILES, FIRE BRICK.***
AND EVERYTHING IN THE FIRE CLAY LINE.

**MANHATTAN**
FIRE BRICK & ENAMELLED CLAY
**RETORT WORKS.**
**ADAM WEBER.**
CLAY GAS RETORTS
AND RETORT SETTINGS,
FIRE BRICKS, TILES, ETC.,
Office and Works, 15th Street and Avenue C., N. Y.

**Borgner & O'Brien,**
MANUFACTURERS OF
CLAY GAS RETORTS
AND RETORT SETTINCS,
FIRE BRICKS, TILES, ETC.
23d St., Above Race,
PHILADELPHIA.
TWENTY YEARS' PRACTICAL EXPERIENCE.

Works, LOCKPORT, PA.
**GARDNER BROTHERS,**
—ESTABLISHED 1864.—
Works, MT. SAVAGE JUNCTION, MD.
**CLAY GAS RETORTS, RETORT SETTINGS, FIRE BRICK, TILES, Etc.**
MINERS & SHIPPERS OF FIRE CLAY.
OFFICE, 116 SMITHFIELD ST., PITTSBURGH, PA.
C. H. SPRAGUE, No. 13 EXCHANGE PLACE, BOSTON, MASS., Agent for the New England States.

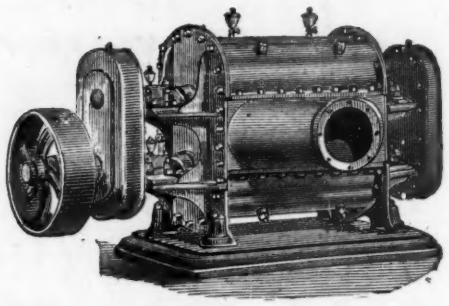
OFFICE, 418 to 422 East 23d St., New York. ESTABLISHED 1856. WORKS, PERTH AMBOY, NEW JERSEY.
**HENRY MAURER,**
**Excelsior Fire Brick & Clay Retort Works**
CLAY GAS RETORTS, BENCH SETTINGS, FIRE BRICK, TILES, ETC.

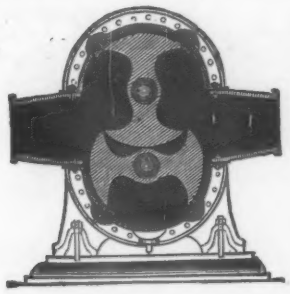
Works, Howard Station, Mo. Pacific R.R.
**EVENS & HOWARD,**
Office, 916 Market Street, St. Louis, Mo.
**FIRE BRICK, GAS RETORTS, AND RETORT SETTINGS.**
SEWER PIPE, 3 TO 24 INCHES DIAMETER.
**Glass Pot Clay, Ground Fire Clay, in Barrels and in Bulk. All kinds of Fire Clay Goods.**

**CHICAGO**
**RETORT & FIRE BRICK WORKS,**
394 to 402 N. WATER ST., CHICAGO, ILL.
GEORGE C. HICKS, PRESIDENT.
STANDARD
**Clay Retorts and Settings,**
**BLOCKS & TILES**
Of every Shape and Size to Order.
**STANDARD FIRE BRICKS.**
Doubled Milled Clay, Ground Bricks, and Fine Sand of Purest Quality.
Non-Conducting Porous Bricks for Bench Fronts.
Special goods for Smelting, Assaying, and Chemical Manufacture.

**THE GAS ANALYST'S MANUAL.**
BY F. W. HARTLEY, A.I.C.E., M.S.E. E. & F. N. SPON, PUBLISHERS.
PRICE, $2.50.
CONTENTS SECTION I.—The purposes of photometry. Standard light. Standard burner. Gas Works Clauses Act-Amendment Act, 1871.—Regulations in respect of testing apparatus, mode of testing for illuminating power, and for sulphuretted hydrogen. Description of standard apparatus. The photometer room. Preparation of candles. Testing operations. Readings. Correction for gas consumpt. Corrections for candles' consumpt. Corrections for barometric pressure and temperature. Ordinary photometers. The inferential or jet photometers. To set the jet photometer at work. To rate the jet photometer.
SECTION II.—Duration and mode of testing in London, sulphuretted hydrogen, ammonia, sulphu compounds. Preparation of solutions. Fitting up. To set the apparatus at work. Analysis.
SECTION III.—Ammonia. Sulphuretted hydrogen. Carbonic acid. The Cooper's Tube, or Eudiometer. To calculate weight of sulphur. Harcourt's color test. A rapid and accurate methodof estimating sulphur in coal gas. Specific gravity. To find the specific gravity of dry gas. To correct the bulk and find the weight of gas.
APPENDIX.—Rules and tables to facilitate the calculations necessary in the determination of the illuminating value and degree of purity of coal gas. Photometry. Ammonia and sulphur. Proving of testing meters in London. The gas referees' cubic-foot measure. Times and mode of testing for pressure in London. Proposed standards of light.
**A. M. Callender & Co., 42 Pine Street, N. Y.**

## P. H. & F. M. Roots'





# IMPROVED GAS EXHAUSTER

**With Engine on same Bed Plate, or without.**

BYE-PASSES, GAS VALVES, GOVERNORS, ELBOWS, PIPE-FITTINGS, &C., FURNISHED TO ORDER.

P. H. & F. M. ROOTS, } Patentees and Manufacturers, { CONNERSVILLE, IND.

S. S. TOWNSEND, General Agent, 6 Cortland St. and 8 Dey St., N. Y.
JAS. BEGGS & CO., Selling Agents, 8 Dey St., N. Y.
WM. COOKE, Selling Agent, 6 Cortland St., N. Y.

Send for Illustrated Catalogue and Price List.

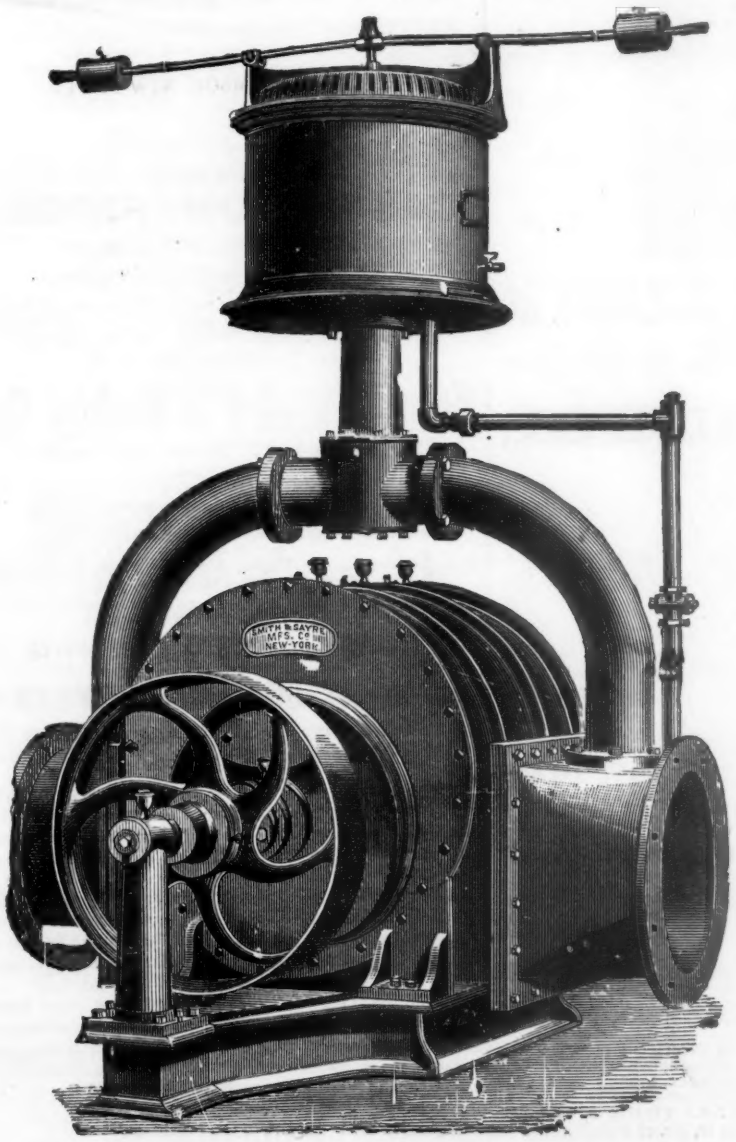
---

**SMITH & SAYRE MANUFACTURING COMPANY.**

No. 245 BROADWAY, N. Y.

BUILDERS OF

## Machinery and Apparatus for Gas Works.




MACKENZIE'S PATENT ROTARY AND STEAM JET GAS EXHAUSTERS, GOVERNORS, COMPENSATORS, BY-PASSES, CONDENSERS, WASHERS, SCRUBBERS.

*ISBELL'S PAT. AUTOMATIC STREET PRESSURE GOVERNOR.*

HIGH SERVICE GOVERNOR, GAS AND WATER VALVES, HYDRAULIC MAIN DIP REGULATOR, BENCH CASTINGS, Etc. PURIFYING BOXES, TOWER SCRUBBERS, WITH AUTOMATIC WATER DISTRIBUTOR. *ISBELL'S PATENT SELF-SEALING RETORT DOORS.*

Plans and Estimates for the Improvement, Extension, or Alteration of Gas Works, or for the Construction o New Works.

G. G. PORTER, *President* CHARLES W. ISBELL, *Secretary.*

---

**MITCHELL, VANCE & CO.**

Manufacturers of

## CHANDELIERS,

And Every Description of

GAS FIXTURES,

Also Manufacturers of

Fine Gilt Bronzes and Marble Clocks, warranted best Time-keepers Mantle Ornaments, &c.

**Salesroom, 836 BROADWAY.**

NEW YORK.

Special designs furnished for Gas Fixtures for Churches Pub Halls Lodges. &c.

---

## F. O. NORTON,

MANUFACTURER OF

## Hydraulic Cement,

Specially adapted for gas works Under water it is capable of giving better results than Portland or any other cement.

**92 Broadway, New York.**

---

# Iron Sponge

AND

## GAS EXHAUSTERS.

**CONNELLY & CO.,**

**No. 407 BROADWAY, NEW YORK CITY**

---

## NEW BOOKS.

OBSERVATIONS ON GLASS AS AN OBSTRUCTOR AND REFLECTOR OF ARTIFICIAL LIGHT, 25 cts.

TRANSPORT OF MATERIALS FOR GAS WORKS, $1.25.

GAS ENGINEER'S DIARY AND TEXT BOOK FOR 1881 $2.00.

**A. M. CALLENDER & CO.,**
42 PINE STREET, N. Y. CITY.

---

## PRESERVE

# The Journal!

**BY THE USE OF**

# THE STRAP FILE.

**Advantages of the Strap File.**

1st. It is simple, strong, and easily used.

2d. Preserves papers without punching holes.

3d. Will always lie flat open.

4th. Allows any paper on file to be taken off without disturbing the others.

We will furnish to our subscribers this important article for preserving, in a convenient form, the numbers of the JOURNAL as it is issued, at the very low price of $1.25. Sent either by express or mail, as directed.

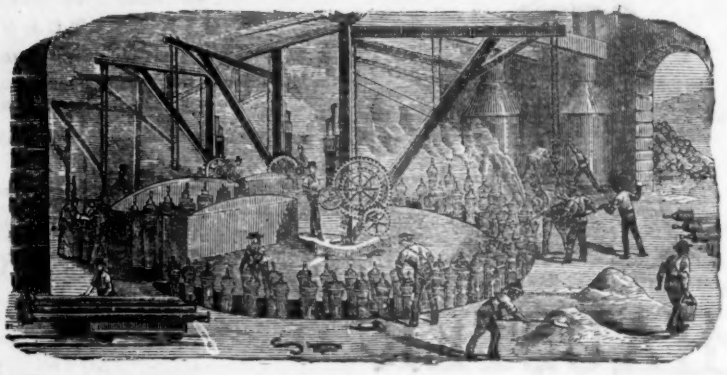
By mail the postage will be 20 cents, which will be added to the price of the Binder.

**A. M. CALLENDER & CO., 42 Pine Street, N.**

# A. H. M'NEAL,

BURLINGTON, N. J.

Flange-Pipes



General Foundry Work.

## CAST IRON PIPES

FOR WATER AND GAS

---

JAMES S. MOORE, Pres.
BENJAMIN CHEW, Treas.

JAS. P. MICHELLON, Sec.
WM. SEXTON, Supt.

## GLOUCESTER IRON WORKS,

GLOUCESTER CITY N. J.

Cast Iron Gas & Water Pipes, Stop Valves, Fire Hydrants, Gasholders. &c.

Office No. 6 North Seventh Street, Philadelphia.

---

ESTABLISHED 1856.

## WARREN FOUNDRY AND MACHINE CO.,

WORKS AT PHILLIPSBURGH, N. J.

NEW YORK OFFICE, 153 BROADWAY.

## *Cast Iron Water and Gas Pipe*

FROM TWO TO FORTY-EIGHT INCHES DIAMETER.

ALSO ALL SIZES OF

**FLANGE PIPE for Sugar House and Mine Work.**

Branches, Bends, Retorts, Etc., Etc. 436-1

---

## SCIENTIFIC BOOKS.

We are prepared to furnish to GAS MANAGERS nd others interested in the topics treated of, the fol lowing Books, at prices named :

**GAS MANUFACTURE,** by WILLIAM RICHARDS. 4 to, with numerous Engravings and Plates, in Cloth binding. $12.

**THE GAS ANALYST'S MANUAL,** by F. W HARTLEY. $2.50.

**ANALYSIS, TECHNICAL VALUATION, PURIFICATION and USE OF COAL GAS,** by Rev. W. R. BOWDITCH, M. A., with Engravings. 8 vo., Cloth. $4.40.

**GAS WORKS STATISTICS,** by CHAS. W. HASTINGS. $1.00

**GAS CONSUMERS HAND BOOK,** by WM. RICHARDS. C. E. 18 mo. Sewed. 20 Cents.

**GAS CONSUMERS MANUAL,** by E. S. CATHELS, C.E. 10 Cents.

**PRACTICAL TREATISE ON HEAT,** by THOMAS BOX. Second edition. $5.

**AIR AS FUEL,** OR PETROLEUM AND OTHER MINERAL OILS UTILIZED BY CARBURETTING AIR, by OWEN C. D. ROSS, Member Institute Civil Engineers. 8 vo. Cloth. $1.50.

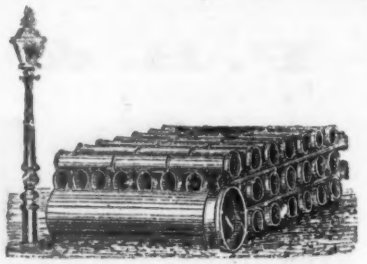
**FODELL'S SYSTEM OF BOOKKEEPING** FOR GAS COMPANIES. $5.

The above will be forwarded by Express. upon receipt of price.

We will take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances must be made by Check, Draft, or Post Office Money Order.

A. M. CALLENDER & CO.,
Room 16, No. 49 Pine St., N. Y

---



## R. D. WOOD & CO.,

PHILADELPHIA.

MANUFACTURERS OF

## CAST IRON PIPE

FOR GAS AND WATER

Lamp Posts, Valves, Etc.

Mathew's Pat. Anti-Freezing Hydrants,

*400 Chestnut Street.*

---

JAMES MARSHALL & CO.

## Franklin Foundry and Pipe Works,

MANUFACTURERS OF

GAS, WATER, AND OIL PIPES

Works, 18th, 19th, 20th and Railroad Street.
Office, No. 23 Nineteenth Street.

Pittsburgh, Pa.

N.B.—Pipes from 3-inch and upwards cast in 12 ft. lengths.
Send for Circular and Price List.

---

## BERGEN IRON WORKS.

R. A. BRICK,

MANUFACTURER OF

## CAST IRON PIPES,

FOR WATER AND GAS,

Valves, Fire and Dock Hydrants,
Lamp-Posts and Flange Work,

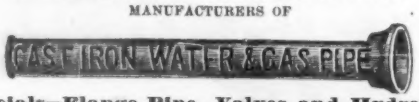
WILLIAM W. CAMPBELL, Selling Agent,
Office, 85 Liberty St., N. Y.

---

## Mellert Foundry & Machine Co.,

Limited. Established 1848.

MANUFACTURERS OF




Specials—Flange Pipe, Valves and Hydrants, Lamp Posts, Retorts, etc.

Machinery and castings for Furnaces, Rolling Mills, Grist and Saw Mills, Mining Pumps, Hoists, etc.

*OFFICES.*—SECOND AND CHESTNUT STS., READING, PA., and 74 PINE ST., NEW YORK CITY.

---

## NATIONAL COAL GAS COMPANY.

320 Broadway, N. Y., Rooms 50, 51 & 52.

H. P. ALLEN, President.

The process known as GWYNNE-HARRIS. but from later most essential improvements, more appropriately called the ALLEN-HARRIS, or AMERICAN HYDROCARBON process for making "Water Gas," by the decomposition of superheated steam, in fire-clay retorts, set similarly to those in Coal Gas Works, is an established success. More than One Hundred Million cubic feet of gas have been made under this process, and for *permanency* and *brilliancy*, as well as economy both to the manufacturer and consumer, it is superior to any gas made by the old, or any other method.

Our process is *not intermittent* but continuous. The steam and the oil are admitted into the retorts by gauge cocks, and run for days without change. All the materials required, besides the steam, are 17 lbs. of Anthracite coal and about 3½ gallons of Petroleum or Naphtha, per 1000 feet of brilliant gas.

Rights for sale. Inquire of the President.

## HERRING & FLOYD,

## Oregon Iron Works,

738, 740, 742 & 744 Greenwich St., N. Y.

## Practical Builders of Gas Works,

MANUFACTURERS OF

**ALL KINDS OF CASTINGS**

AND

**APPARATUS FOR GAS-WORKS.**

**BENCH CASTINGS**
from benches of one to six Retorts each.
**WASHERS: MULTITUBLAR AND AIR CONDENSERS; CONDENSERS; SCRUBBERS**
wet and dry), and
**EXHAUSTERS**
for relieving Retorts from pressure.
**BENDS and BRANCHES**
of all sizes and description.

FLOYD'S PATENT
**MALLEABLE RETORT LID.**

PATENT
**SELF-SEALING RETORT LIDS.**

FARMER'S
**PATENT BYE-PASS DIP-PIPE.**

SABBATON'S PATENT
**FURNACE DOOR AND FRAME.**

BUTLER'S
**COKE SCREENING SHOVELS.**

GAS GOVERNORS,
and everything connected with well regulated Gas Works at low price, and in complete order.

SELLER'S CEMENT
for stopping leaks in Retorts.

N. B.—**STOP VALVES** from three to thirty inches—at very low prices.

Plans, Specifications, and Estimates furnished.

SILAS C. HERRING. JAMES R. FLOYD.

---

H. RANSHAW, Pres. & Mangr. T. H. BIRCH, Asst. Mangr.
WM. STACEY, Vice-Pres. R. J. TARVIN, Sec. & Treas.

## STACEY MANUFACTURING CO.,

MANUFACTURERS OF

## Single and Telescopic Gasholders,

**IRON ROOFS, BRIDGES, LAMP POSTS,**

WATER AND OIL TANKS, COAL ELEVATOR CARS,

**COKE CRUSHERS,**

## BENCH CASTINGS,

And all kinds of Wrought and Cast Iron Work used in the erection of Coal and Oil Gas Works. Rolling Mill Machinery and Heavy Castings a Specialty.

**Foundry:** 33, 35, 37, & 39 Mill St.,
**Wrought Iron Works:** 16, 18, 20, 22, 24, & 26 Ramsey St.,

**CINCINNATI, OHIO.**

---

## MORRIS, TASKER & CO.,

**Limited,**

## Builders of Gas Works,

**PHILADELPHIA, PA.**

---

**1842. DEILY & FOWLER 1881**

## *LAUREL IRON WORKS.*

ADDRESS, 39 LAUREL STREET, PHILA

MANUFACTURERS OF

## GAS HOLDERS,

*SINGLE AND TELESCOPIC—WITH CAST OR WROUGHT IRON GUIDE FRAMES.*

We are prepared to furnish Holders, Wrought Iron Roof Frames, Bench Castings, Condensers, Scrubbers, Purifiers, Drips, Bends, Tees, and all other Iron Work connected with Gas Works. We have built 12 gas works and 135 gasholders. Personal supervision given to the erection of all our work. Holders built at following places since 1868:

Lancaster, Pa. (2)
Williamsport, Pa. (3)
Bristol, Pa. (2)
Catasaqua, Pa.
Kittanning, Pa.
Hazelton, Pa.
Freeport, Pa.
Huntingdon, Pa.
Pittston Pa.
Bethlehem (S). Pa.
Sharon, Pa.
Canton, Pa.
Carlisle, Pa.
Beaver Falls, Pa.
Annapolis, Md. (2)
Parkersburg, W. Va.
Lynchburg, Va.
Stanton, Va.
Youngstown, O
Steubenville, O.
Zanesville, O.
Mansfield, O.
Marion, O.
Bellevaire, O.
Athens, O.
Barnesville, O.
Newark, O.
Columbus, O.
Franklin, Ind.
Plainfield, N. J.
Englewood, N. J.
Flemington, N. J. (2)
Dover, Del.
Pittsfield, Mass.
Meriden, Conn.
Indianapolis, Ind.
Jacksonville, Ill.
Joliet, Ill.
Lawrence, Kansas.
Jefferson City, N. O. La. (2)
Algiers, N. O., La.
Kalamazoo, Mich
Buffalo, N. Y. (2)
Ogdensburg, N. Y.
Waverly, N. Y.
Little Falls, N. Y.
Penn Yann, N. Y.
Watkins, N. Y.
Coney Island, N. Y.
Batavia, N. Y.
Gloucester, N. J.
Salem, N. J.
Milwaukee, Wis.
Burlington, Vt.
Hoosick Falls, N. Y.
Attica, N. Y.
Mount Holly, N. J.
Mount Joy, Pa.
Rockaway Beach, L. I. (2)
Zanesville, O. (2)
Lancaster, O.
Blackwell's Island, N Y
Waltham, Mass.
Dorchester, Mass.
Wheeling, W Va.
Lansing, Mich.
Flint, Mich.
Milton, Pa,
Galveston, Texas.

---

## NOW READY,

VOLUMES I., II., AND III. OF

## King's Treatise on Coal Gas

BOUND IN CLOTH. PRICE, $10 EACH.

**A. M. CALLENDER & CO.,**

42 Pine Street, N. Y.

---

## The Kerr Murray Mfg. Co.,

THE LATEST IMPROVED

## *Gas Apparatus*

AND

## MACHINERY,

**Wrought Iron Roofs and Bench Castings,**

**SINGLE LIFT AND TELESCOPIC GASHOLDERS.**

***FORT WAYNE, IND.***

---

## BARTLETT, HAYWARD & CO.

**ARCHITECTURAL IRON WORKS.**

MANUFACTURERS OF

GAS HOLDERS, BENCH CASTINGS, MULTITUBULAR WATER AND AIR CONDENSERS, COMMON AND TOWER SCRUBBERS, ROTARY & STEAM JET EXHAUSTERS, WROUGHT IRON ROOF FRAMES.

**MANUFACTURERS OF ALL DESCRIPTIONS OF GAS APPARATUS.**

*WORKS:*

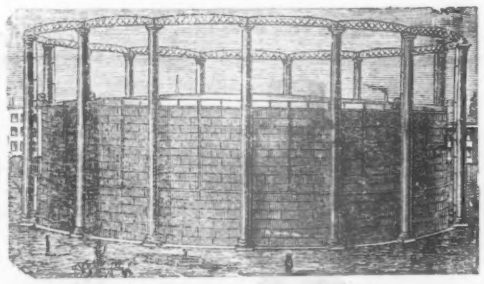
Cors. Pratt, Scott, McHenry, Ramsay and Bartlett Streets.

**BALTIMORE, MARYLAND.**

Plans, Specifications, and Estimates furnished. Correspondence solicited. 467-1y

---

## CONTINENTAL WORKS.



GASHLODERS OF ANY MAGNITUDE.

**T. F. ROWLAND, Proprietor,**
**GREENPOINT, BROOKLYN, N. Y**
ENGINEER AND MANUFACTURER OF

## GAS-HOLDERS.

**CONDENSERS, SCRUBBERS, VALVES, PURIFIERS, RETORTS, and HYDRAULIC MAINS,**

and all other articles connected with the Manufacture and Distribution of Gas. Plans and Specifications prepared and Proposals given for the necessary Plans for Lighting Cities, Towns, Mansions, and Manufactories.

---

## P. MUNZINGER,

**Engineer and Builder,**

**No. 1211 MARKET STREET, PHILADELPHIA, PENN.**

## BUILDER AND CONSTRUCTOR OF ALL KINDS OF GAS MACHINERY,

**ON THE LATEST AND MOST IMPROVED PLAN.**

***Bench Castings, Condensers, Scrubbers, Purifiers, Centre Valves, Gasholders, Stop Valves, Etc., Etc.***

**Estimates and Drawings Furnished upon Application.**

GAS COALS. GAS COALS. GAS COALS.

# "SCOTT'S" OCEAN MINE

# YOUGHIOGHENY GAS COAL.

**W. L. SCOTT & CO., Proprietors, ERIE, PA.**

This Colliery is located at Scott Haven, on the Youghiogheny River, Westmoreland County, Pa., directly adjoining the Penn Company's Youghiogheny Mine. (See map on p. 27, Vol. XXXVI., of this Journal.)

The property consists of over **3,300 ACRES,** situated in the center of the celebrated Youghiogheny Coal Field, and comprises within its limits the **MOST VALUABLE GAS COAL** in Western Pennsylvania.

Over **300,000 TONS,** of this coal have been forwarded to Baltimore during 1880 and 1881, distributed among **OVER SIXTY GAS LIGHT COMPANIES,** from Bangor, Maine, to Galveston, Texas.

The universal favor with which this coal has been received has induced Messrs. Scott & Co. to increase their already large facilities for meeting the wants of Gas Companies, giving to consumers an undoubted guarantee that delivery will be promptly made. Applications addressed to the undersigned will meet with prompt response.

Orders for delivery in **NEW ENGLAND** can be addressed to our Boston office, No. 21 EXCHANGE PLACE or P. O. Box 3003, BOSTON.

**PERKINS & CO., General Sales Agents,**

New York P. O. Box, 3695. **45 SOUTH STREET, N. Y.**

**G. W. DRESSER, C.E.,**

Member American Society Civil Engineers.

**CONSULTING ENGINEER**

ON ALL MATTERS PERTAINING TO

**Gas Manufacture.**

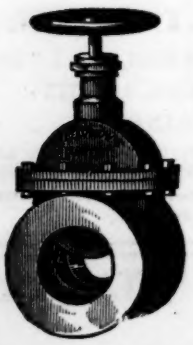
**LUDLOW**

**Valve Manf'g Co.,**

OFFICE AND WORKS

**38 to 954 River Street and 67 to 83 Vail Ave.**

TROY, NEW YORK.



REFERENCES FURNISHED. SEND FOR CIRCULARS.

**BRASS AND IRON SLIDE VALVES,**

Double and Single Gate, ¼ inch to 36 inch—outside and inside screws, Indicator, etc.,—for Gas, Water, Steam, and Oil.

HYDRAULIC MAIN DIP REGULATORS.

ALSO

**FIRE HYDRANTS.**

**C. GEFRORER.**

Manufacturer of

**GAS BURNERS.**

GAS HEATING AND COOKING APPARATUS.

**FITTERS' PROVING APPARATUS, ETC.**

No. 284 North Eighth Street, Philadelphia.

**KING'S TREATISE**

ON

**COAL GAS.**

Vol. I., Bound in Cloth, $10.

**A. M. CALLENDER & CO.,** 42 Pine Street, N. Y.

S. McCRICKART, Pres't. J. E. McCRICKART, Mang'r.

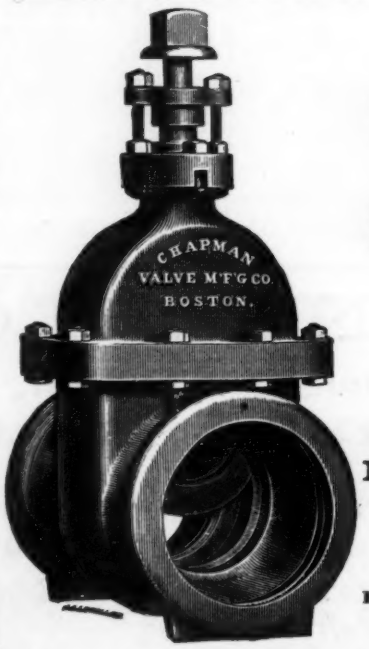
**THE FORT PITT COAL CO.,**

Miners and Shippers of

COAL FORT PITT GAS COAL COKE

No. 337 Liberty Street,

**PITTSBURGH, PENN.**




**CHAPMAN**

**VALVE MANUFACTURING COMPANY,**

MANUFACTURERS OF

**Steam, Gas, and Water Valves and Gates.**

**FIRE HYDRANTS**

WITH POSITIVE DRIP.

All Valves and Hydrants furnished with

**Babbitt Metal Seats & Non-Corrosive Working Parts.**

**WORKS AT INDIAN ORCHARD, MASS.**

**Boston Office, 77 Kilby St. New York Office, 28 Platt St.**

ALL WORK GUARANTEED.

GAS COALS. GAS COALS. GAS COALS,


NEW YORK AND CLEVELAND

**GAS COAL COM'Y**

Of Pittsburgh, Pa.

MINERS AND SHIPPERS OF

YOUGHIOGHENY GAS COAL.

This Company is prepared to furnish any amount of their justly celebrated, and acknowledged superior GAS COAL, to any point reached by railroad or navigation, on most favorable terms.

General Office—89 Wood Street, PITTSBURGH, PA.

Branch Office—120 Water Street, CLEVELAND, OHIO.

WILLIAM A. McINTOSH, President.
A. CARNEGIE, Vice-President.
W. P. DE ARMIT, Treasurer.
THOMAS AXWORTHY, Agent at Cleveland, Ohio.

351-1y

NEWBURGH

**ORREL COAL COMPANY,**

MINERS AND SHIPPERS OF

Newburgh Orrel, Tyrconnell and Palatine Gas Coals.

ALSO SHIPPERS OF

FOUNDRY COKE

Mines Situated at

NEWBURGH, FLEMINGTON, AND FAIRMONT, WEST VIRGINIA,

HOME OFFICE,

*25 S. Gay St., Baltimore.*

CHARLES MACKALL,
*SECRETARY.*

CHAS. W. HAYES, Agent in New York,

No. 111 Broadway - - Trinity Building.

Shipping wharves at Locust Point. References furnished when required. Special attention given to chartering vessels.

THE

**PENN GAS COAL COMPANY**

OFFER THEIR

COAL, CAREFULLY SCREENED,

AND PREPARED FOR

**GAS PURPOSES.**

Their Property is located in the Youghiogheny Coal Basin, near Irwin's and Penn Station on the Pennsylvania Railroad, and on the Youghiogheny River.

OFFICES

No. 209 South Third Street, Phil'a. 90 Wall Street, New York.

PLACES OF SHIPMENT.

Pennsylvania Railroad, Pier No. 2 (Lower Side).
Greenwich Wharves, Delaware River.
366-1y Pier No. 1 (Lower Side), South Amboy, N. J.

**CANNELTON COAL COMPANY**

Miners of the celebrated CANNELTON CANNEL, acknowledged to be the *best enricher* produced in this country, yielding 10,000 cubic feet of 64.54 candle gas per ton of 2,240 pounds.

J. TATNALL LEA, Treasurer, P. O. Box 1747 Philadelphia.

SALES AGENTS: C. & O. R'way Coal Agency N. Y. BENEDICT & DOWNS, New Haven. DANIEL W. JOB & CO., Boston. DAVIS, MAYER & CO., Baltimore.

**Chesapeake & Ohio Railway Coal Agency,**

FOR THE SALE OF THE

SUPERIOR KANAWHA GAS COALS,

Also, SPLINT AND STEAM COALS,

From the Kanawha and New River Regions, on the line of the Chesapeake & Ohio R'way.

C. B. ORCUTT, SECRETARY.
J. J. GORDON, SALES AGENT.

OFFICE, 22 PINE STREET, N. Y.

*THE AMERICAN*

*GAS-LIGHT JOURNAL.*

$3 PER ANNUM.

42 Pine Street, N. Y.

THE DESPARD COAL COMPANY

OFFER THEIR SUPERIOR

DESPARD COAL

To Gas Light Companies throughout the country.

Agent, ALFRED PARMELE, No. 32 Pine street, N. Y.

BANGS & HORTON, No. 31 Duane street, Boston.
Mines in Harrison County, West Virginia.
Wharves Locust Point, Company's Office, 15 German St., Baltimore.

Among the consumers of Despard Coal, we name: Manhattan Gas Light Company, New York; Metropolitan Gas Light Company, New York; Jersey City Gas Light Company, N. J.; Washington Gas Light Company; Portland Gas Light Company, Maine

*.* Reference to them is requested. 904-1

**"Economy of Gas as a Fuel for Cooking Purposes."**

This is a small Pamphlet containing the Paper read by

MR. WILLIAM W. GOODWIN, OF PHILADELPHIA, PA.,

At the recent meeting of the American Gas Light Association.

IT IS INTENDED FOR GRATUITOUS DISTRIBUTION BY GAS COMPANIES AMONG THEIR CONSUMERS

Price, Twelve Dollars per Thousand.

A. M. CALLENDER & CO., No. 42 Pine Street, New York.

## INTERNATIONAL--1876--EXHIBITION.

## The U. S. Centennial Commission

HAVE DECREED AN AWARD TO

## *HARRIS, GRIFFIN & CO.,*

**12th and Brown Sts., Philadelphia, and 49 Dey St., N. Y., U. S, A..**

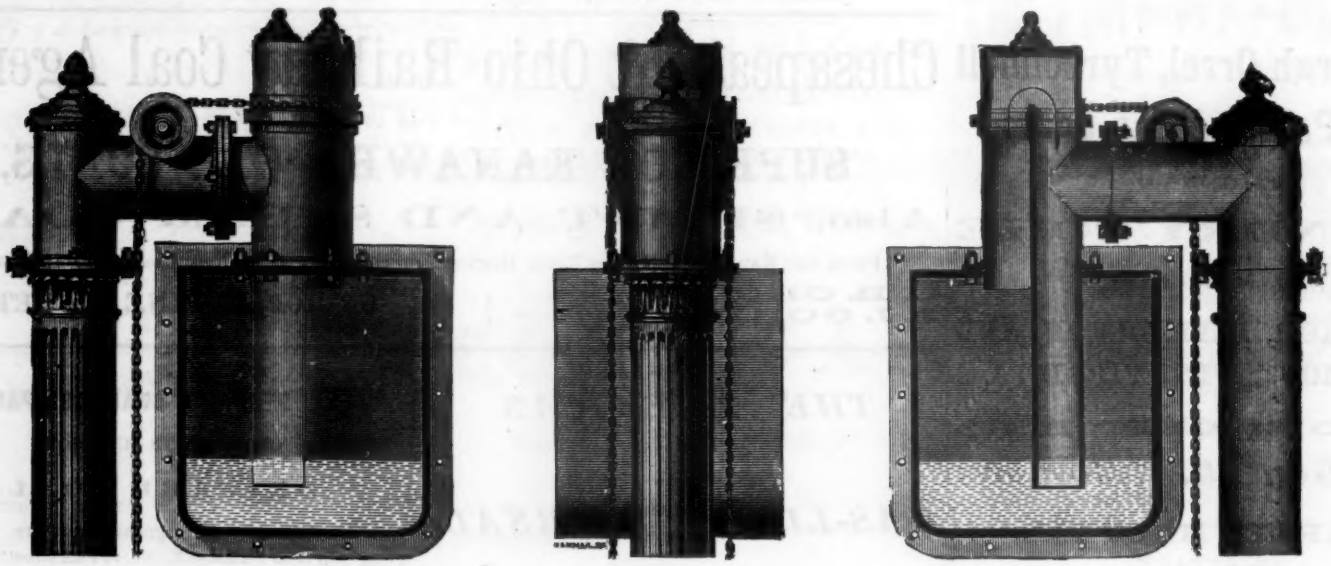
FOR THE FOLLOWING REASONS:

**The Exhibit consists of a Series of METERS from the Largest Size Station Meters for the use of the MANUFACTURE OF GAS, to those for the use of the ORDINARY CONSUMER. The Instruments are WELL MADE, RELIABLE as to INDICATION, and embody a number of sundry improvements which, with the general character of the Exhibit, entitle the whole to commendation.**

Attest—J. L. CAMPBELL, Secretary, pro-tem. | Signed—A. T. GOSHORN, Director General | J. R. HAWLEY, President

## FARMER'S PATENT

# BYE-PASS DIP-PIPE.



FARMER'S PATENT BYE-PASS DIP-PIPE.

## WILLIAM FARMER,

## ARCHITECT AND GENERAL GAS ENGINEER,

ROOMS 87, 89, 91, 111 BROADWAY, NEW YORK.

WILLIAM FARMER may be consulted upon all matters relating to the Manufacture of Illuminating Gas. Will furnish Specifications, Drawings, and Estimates for the Erection of Gas Works of any Capacity, and will erect the same either on Commission or by Contract.

Having made the Construction of Gas Works a Specialty, perfect satisfaction can be guaranteed.

Sole Agent for the FOULIS HYDRAULIC MACHINE for Drawing and Charging Retorts.

Sole Agent for the AITKEN and YOUNG PROCESS FOR MAKING ILLUMINATING GAS.

PATENTEE OF THE FOLLOWING INVENTIONS.

**EXHAUSTER (Screw Propeller)** for Gas or Air, and Condensation. **DUMPING BARROW** for Wheeling Coal, Coke and Lime, Etc. **HYDRAULIC MAIN** for Reducing Pressure on Retorts. **ZIGZAG SCRUBBERS** for Naphthalizing the Gas and Removing the Tar, Ammonia, and Naphthaline. **BYE-PASS DIP PIPE** for reducing the Pressure on Retorts, Etc., as per cut above. **SELF-ACTING WATER DISTRIBUTOR** for Scrubbers and Washers, Etc. **MOVABLE DIP PIPE** for Reducing and Equalizing the Pressure on Retorts. **TOWER SCRUBBERS (Jacketed)** for Economizing Space and Building Material. **DUPLEX CENTRE SEAL** for Keeping all the Boxes in a set continuously in action.

REFERS BY PERMISSION TO THE FOLLOWING GENTLEMEN.

Professor B. SILLIMAN, New Haven, Conn.
BEN. CHAS. ROOME, President Manhattan Gas-Light Company, N. Y.
GEO. A. HICKENLOOPER, President Cincinnati Gas-Light Co., Cincinnati, Ohio.
A. W. ERVIN, President Brooklyn Gas-Light Company, Brooklyn, N. Y.
D. HOSTETTER, President Pittsburgh Gas-Light Co., Pittsburgh, Pa.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
S. L. HUSTEL, President Laclede Gas-Light Company, St. Louis, Mo.
E. VANDERPOOL, Engineer, Newark Gas-Light Company, Newark, N. J.

T. C. HOPPER, Prest. WM. H. HOPPER, Vice-Prest. WM. N. MILSTED, Gen. Supt. and Treas. WM. H. DOWN, Sec.

# AMERICAN METER COMPANY,

WET AND DRY GAS METERS. PRESSURE REGISTERS. METER PROVERS.
STATION METERS. PRESSURE & VACUUM REGISTERS. PORTABLE TEST METERS.
EXHAUSTER GOVERNORS. PRESSURE & VACUUM GAUGES. EXPERIMENTAL METERS.
DRY CENTRE VALVES. CRESSON GAS REGULATORS. AMMONIA TEST METERS.
GOVERNORS FOR GAS WORKS. MARSLAND WATER METERS. BAR AND JET PHOTOMETERS.

**Manufactories:**
512 W. 22d St., N. Y.
Arch & 22d Sts., Phila.

GAS STOVES—AMERICAN, FRENCH, & ENGLISH.
SUGG'S ILLUMINATING POWER METER.
SUGG'S "STANDARD" ARGAND BURNERS. ALSO NN AND TTT.
Wet Meters, with Lizar's "Invariable Measuring" Drum.
Sole Agents for Wm. Cowan's Automatic Pressure Changer.

**Agencies:**
37 Water Street, Cincinnati.
20 South Canal Street, Chicago.
810 North Second Street, St. Louis.
122 & 124 Sutter St., San Francisco.

## HELME & McILHENNY,

Successors to Harris & Brother.

ESTABLISHED 1848.

## PRACTICAL GAS METER MANUFACTURERS,

Continue as heretofore at the OLD ESTABLISHMENT, Nos. 1115 and 1117 Cherry Street, Philadelphia, Pa.,

To manufacture Wet and Dry Gas Meters, Station Meters, Experimental Meters, Meter Provers, Centre Seals, Governors, Pressure Registers, Indicators, Photometers, and all kinds of Gas Apparatus; Also furnish all other Articles appertaining to the use of Gas Works.

*From our long Practical Experience of the Business (covering a period of 33 years) and from our personal supervision of all Work, we can guarantee all orders to be executed promptly, and in every respect satisfactorily.*

WILLIAM HELME. JOHN McILHENNY.

WM. WALLACE GOODWIN, Prest. and Treas. WM. H. MERRICK, V.-Prest. H. DUMONT WAGNER, Supt. S. L. JONES, Sec. S. V. MERRICK, Asst. Sec

## THE GOODWIN GAS STOVE AND METER COMPANY,

Successors to W. W. GOODWIN & CO.

***No. 1012, 1014 and 1016 Filbert Street, Philadelphia, Pa.***

***No, 142 Chambers Street, New York***

MANUFACTURERS OF GAS STOVES FOR COOKING AND HEATING PURPOSES.

Dry and Wet GAS METERS, Station Meters (Square, Cylindrical or in Staves) Glazed Meters, King's and Sugg's Experimental Meters, Lamp Post Meters, Etc., Etc., Meter Provers (sizes 2, 5 and 10 feet), Pressure Guages of all kinds, Pressure Registers, Pressure and Vacuum Registers, Pressure Indicators (sizes 4 inch, 6 inch and 9 inch), King's Pressure and Vacuum Gauges, Dry and Wet Centre Seals, Dry and Wet Governors, Exhauster Governors, Photometers of all descriptions. Letheby's Sulphur and Ammonia Test Apparatus complete—also Testing and Chemical Apparatus of all kinds, and of the most perfect description, for all purposes relating to Gas.

**Goodwin's Improved Lowe's Jet Photometer.**

Special attention to repairs of Meters, and all apparatus connected with the business.
All work guaranteed first class in every particular, and orders filled promptly.

## Review of Gas and Water Engineering.

*ISSUED WEEKLY.*

Edited and Published by CHAS. W. HASTINGS, 22 Buckingham St., London, Eng.

*Each number contains articles in connection with the manufacture and supply of Gas; summary of latest intelligence on the subject of Electric Lighting; articles upon Water Supply; also on the Construction and Maintenance of Gas, Water, and Sewage Works.*

**Price, 13s., Postpaid.**

## The Gas and Water Companies' Directory.

**Edited and Published Annually by CHARLES W. HASTINGS.**

This Work gives a complete list of all Gas and Water Companies throughout England, Scotland, Ireland and Wales; date of formation, amount of capita and names of all officers, etc.; including carbonization returns, prices paid for gas, dividends, etc.

*Price, in Cloth Covers, 5s; Paper Covers, 3s. 6d. Postage Extra*

Address, 22 BUCKINGHAM STREET,
**Orders Received at this Office.** LONDON, W. C., ENGLAND

NOW READY AND FOR SALE,

## FODELL'S
## System of Bookkeeping
FOR GAS COMPANIES.

Price $5, which should be sent either in Check P. O. Order or Registered Letter.

Blank Books, with printed headings and forms on this system, will be supplied to Gas Companies, by applying to W. P. FODELL Philadelphia, or

A. M. CALLENDER & CO
OFFICE GAS LIGHT JOURNAL, 42 Pine St., N. Y

## CATHEL'S
## GAS CONSUMERS MANUAL.

Enables every Gas Consumer to ascertain at a glance, without any previous knowledge of the Gas Meter, the quantity and money value of the Gas consumed. Also the best method of obtaining from Gas the largest amount of its light.

It will be to the advantage of Gas Companies to supply their Consumers with one of these Guides, as a means of preventing complaints arising from their want of knowledge in regard to the registration of their meters. For sale by

A. M. CALLENDER & CO.,
42 Pine Street, New York.

# THE GOODWIN GAS STOVE AND METER CO.,

**Successors to W. W. GOODWIN & CO.,**

**1012, 1014 & 1016 Filbert St., Phila., 142 Chambers St., N. Y., 126 Dearborn St., Chicago.**

**Agents, WALDO BROTHERS, 88 Water Street, Boston.**

BRAY'S PATENT LANTERN.

SOLE AGENTS IN AMERICA FOR

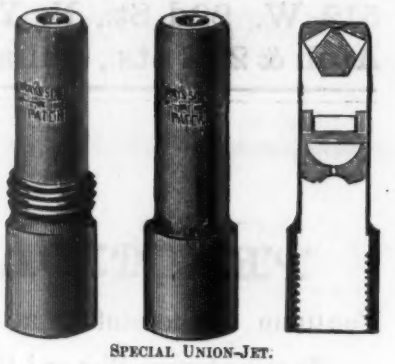
## BRAY'S

## PATENT FLAT-FLAME BURNERS

AND

## BRAY'S

## Patent Lanterns



SPECIAL UNION-JET.

**The Special Burners are made for both High and Low Pressure. In ordering Burners our customers will confer a favor by stating the Pressure.**

**Bray's Patent Standard Slit-Union Burners do not Corrode in any Atmosphere.**

STANDARD SLIT-UNION.

**They give a Permanently Well-shaped Flame, free from Roaring and Flickering.**

SPECIAL SLIT-UNION.

The "Special" Burners, as improved, are more adaptable to the requirements of gas illumination than any now before the public. They can be made to suit any pressure or quality of gas (including air gas). The gas inlet is so placed that it cannot be tampered with, and they are not liable to get out of order.

The following table and sentences in quotation marks are taken from the report of S. C. Ford, the United States Inspector of Gas and Meters at Washington, D. C., for the year 1881:

| Description of Burner. | Pressure at points of ignition. | Actual consumption of gas per hour. | Illuminating power in candles at rate of actual consumption. | Illuminating power in candles, at rate of 5 cu. ft. per hour. | Value of one foot of gas in terms of standard candles. |
|---|---|---|---|---|---|
| | Inches. | Cubic Feet. | Candles. | Candles. | Candles. |
| Bray's Standard Slit-Union (30 candles.... | .255 | 6.90 | 30.04 | 21.76 | 4.35 |
| " Special Slit-Union No. 7..... | .50 | 4.74 | 19.20 | 20.25 | 4.05 |
| " " " No. 6..... | .50 | 4.10 | 16.61 | 20.25 | 4.05 |
| " " " No. 5..... | .50 | 4.24 | 16.97 | 20.01 | 4.00 |
| " " " No. 4..... | .60 | 3.49 | 12.58 | 18.02 | 3.60 |
| " " Union Jet No. 7..... | .50 | 4.84 | 19.13 | 19.76 | 3.95 |
| " " " No. 6..... | .55 | 4.32 | 17.10 | 19.79 | 3.95 |
| " " " No. 5..... | .60 | 4.14 | 15.65 | 18.90 | 3.78 |
| " " " No. 4..... | .55 | 3.38 | 12.04 | 17.81 | 3.56 |
| " Regulator Union Jet No. 7..... | .50 | 4.99 | 17.69 | 17.72 | 3.54 |
| " " " No. 6..... | .50 | 5.18 | 17.63 | 17.01 | 3.40 |
| " " " No. 5..... | .60 | 4.37 | 13.71 | 15.68 | 3.13 |
| " " " No. 4..... | .60 | 3.97 | 11.46 | 14.43 | 2.88 |

"On examination of the above table of tests, made with various burners, it will be observed that the illuminating power obtained with Bray's special burners Nos. 5, 6, and 7, both slit-union and jet form, was high; but with Bray's regulator burners only moderately good."

"The result of test with Bray's standard slit-union burner was highly satisfactory. This burner is best suited for street illumination, and will yield the maximum power obtainable from a cubic foot of gas."

"The special burners manufactured by Bray & Co. compare favorably with any yet inspected by this office. They are well made, and no doubt will prove very durable in practical use. They are best adapted for gases of high gravity."

Bray's Patent Standard Slit-Union Burners are of 30, 40, 50, 60, 70, and 80 candle power. The Patent Lanterns are adapted for burners of 50, 80, 100, 200, 300, 400, and 800 candle power, and are acknowledged to be the best lantern for street lighting yet invented. Price Lists and Circulars furnished on application.

**WM. W. GOODWIN, Pres. & Treas.**
**WM. H. MERRICK, Vice-Pres.**

**S. LEWIS JONES, Sec.**
**H. DUMONT WAGNER, Supt.**

**SAMUEL V. MERRICK, Asst. Sec.**
**G. B. EDWARDS, Mang. N.Y. Branch.**